A REVISION OF THE BRITISH MITES OF THE GENUS *PERGAMASUS* BERLESE S.LAT. (ACARI: MESOSTIGMATA)

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BY

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INTRODUCTION

MITES of the family Parasitidae, in its present concept, were included in the genus *Gamasus* Latr. until Berlese (1892) subdivided the genus into three subgenera, *Gamasus* s. str., *Eugamasus* Berl. and *Hologamasus* Berl. This division was based primarily on the form of the sclerotization of the idiosoma in the adult female and the nature of the gnathosomal corniculi in the male. In 1904, Berlese proposed three other subgenera, namely, *Trachygamasus* (type *Gamasus pusillus* Berl.), *Pergamasus* (type *Acarus crassipes* Linn.) and *Amblygamasus* (type *Gamasus tiberinus* Can.) although these were not defined until Berlese (1906) published his " Monografia del Genere *Gamasus* ". The genus *Trachygamasus* was characterized by the absence of metasternal shields in the female (actually the metasternals are completely fused with each other and the sternal shields) while the two other subgenera were essentially based on the armature of the second pair of legs in the male.

Berlese's concepts of the classification of the '*Gamasus*'-complex have been subject to little revision subsequently although each of his subgenera has, at one time or another, been given generic rank. Hull (1918) for example, recognized Berlese's groupings but gave generic rank to *Ologamasus*, *Pergamasus* and *Gamasus*, whilst he considered *Amblygamasus* to be a subgenus of *Pergamasus*, and *Eugamasus* a subgenus of *Gamasus*. This author also proposed a further division of *Pergamasus* and erected the subgenera *Paragamasus* and *Plesiogamasus*. Since Berlese's monograph four genera have also been added to the family, namely, *Oocarpais* Berlese, 1916, *Parasitellus* Willmann, 1939, *Gamasodes* Oudemans, 1939 and *Pergamasellus* Evans, 1957. Certain nomenclature changes have also been necessary, such as *Parasitus* Latr. having priority over *Gamasus* Latr. and *Holoparasitus* Oudemans 1936 being proposed as a new name for *Ologamasus* Berlese, 1892 *non* Berlese, 1888.

The contributions to the knowledge of the Parasitidae within the past forty years have largely been in the form of descriptions of new species with little or no attempt at critical revisions at generic level. European workers have been particularly prominent in the field, new species having been described, amongst others, by Oudemans (1902, 1904, 1912, and 1926), Voigts and Oudemans (1904), Bonnet (1911), Hull (1916 and 1918), Halbert (1915), Trägårdh (1910 and 1936), Vitzthum (1926), Willmann (1932, 1938, 1939, 1940, 1949, 1951, 1953, 1954 and 1956), Sellnick (1929, 1940), Pax & Willmann (1937), Leitner (1946 & 1946a), Cooreman (1943, 1951), Schmolzer (1953), Halaskova (1959) and Schweizer (1961). Schweizer's key to the Parasitidae of Switzerland, published posthumously in 1961, has been the only attempt at a complete regional revision of the family since Hull (1918).

This work presents a revision of the British mites of the genus *Pergamasus* Berl. s. lat. Members of this genus are amongst the most important acarine predators in Palaearctic soils although they appear to be replaced by the Rhodacaridae in tropical soils (Evans, *in litt.*). The confusion concerning the identity of the species of this relatively large genus limits the scope of ecological work on the rôle played by these mites in the arthropod community of the soil. Although Turk (1953) lists twenty-four species and varieties of *Pergamasus* (including *Amblygamasus*, *Paragamasus* and *Plesiogamasus*) for the British Isles only a small percentage of these can be identified with certainty. It is intended that this work will remedy, in part, this confusing situation and also, by the detailed study of the external morphology of the species, provide new criteria for their classification.

The type material is deposited in the Collections of the British Museum (Natural History).

METHODS

This revision is largely based on identified and unidentified specimens of *Pergamasus* in the Collections of the British Museum (Natural History). This material was supplemented by Berlese-Tullgren extractions of litter and other organic debris made by the author.

The specimens were prepared for microscopical study by clearing them in 60% lactic acid. All the figures have been made from temporary preparations in lactic acid. Structures requiring detailed study, for example leg II of the male, chelicerae, pedipalps and the genital shield of the female, were dissected and prepared separately. Specimens were orientated in cavity slides for studying structures situated laterally, for example the peritreme and peritrematal shield.

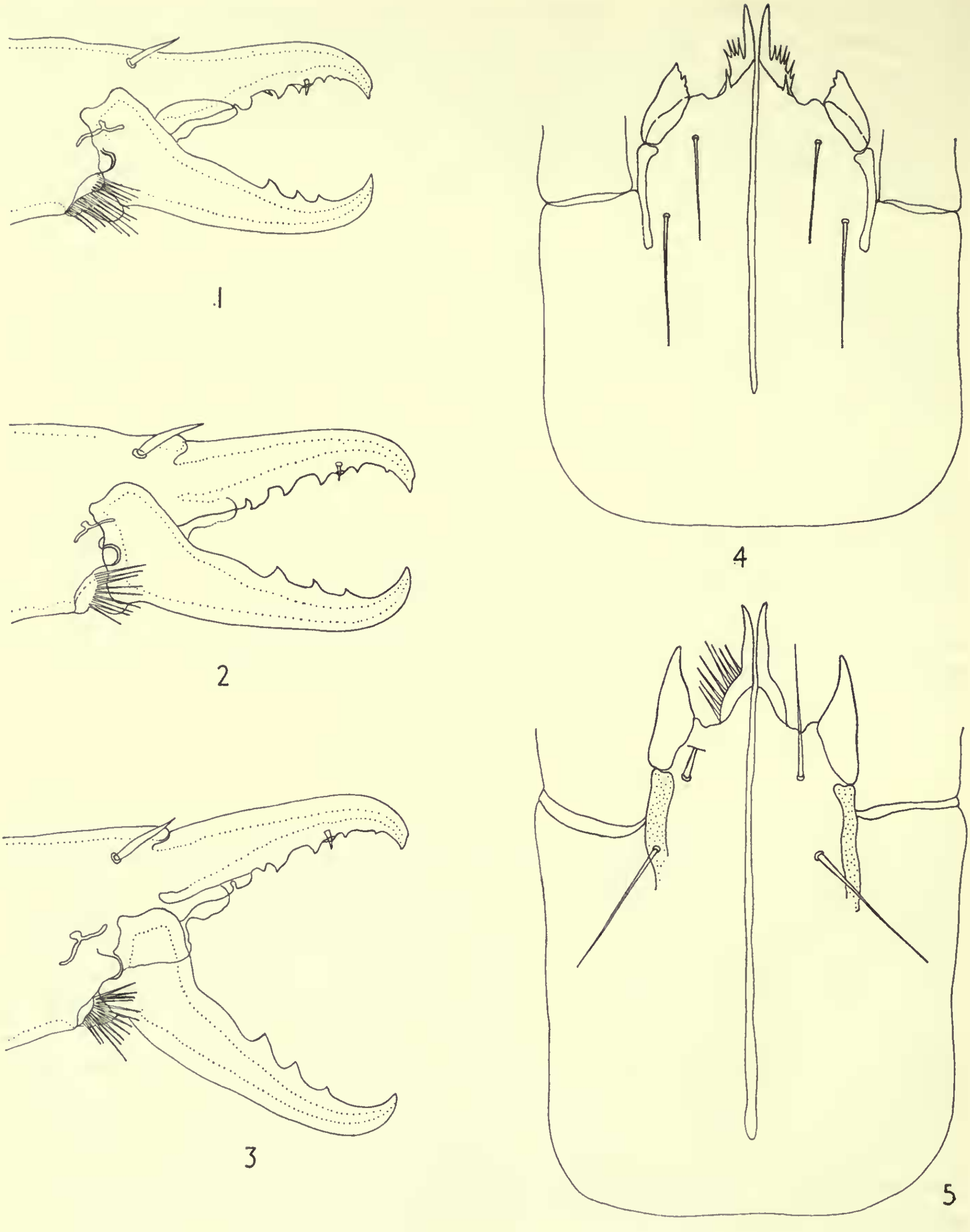
The three species cultured under laboratory conditions were confined in small petri dishes containing a charcoal and Plaster of Paris base of the type used by Bhattacharyya (1962). They fed on various species of Collembola.

EXTERNAL MORPHOLOGY

Chelicerae

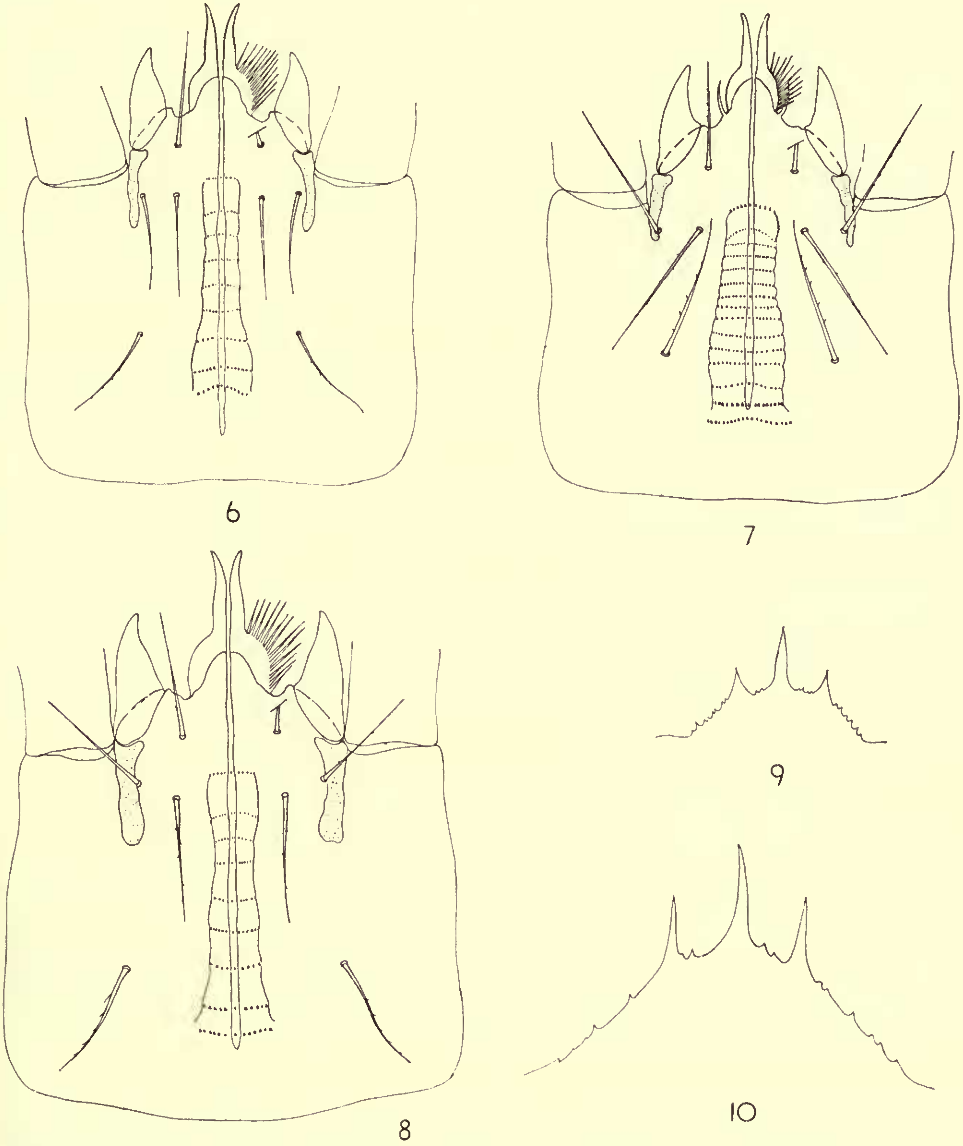
The chelicerae are three-segmented with the basal segment short, the second segment long and terminating in the fixed digit, and the third segment represented by the movable digit. Both digits are invariably dentate. The movable digit in the male and females of the *Paragamasus*-group of species bears one, two or three well-defined teeth (Text-figs. 185, 228) whilst in the *Pergamasus*-group the dentition is more variable. The pilus dentilis is simple in all species examined. The shape and number of teeth on the fixed digit of both groups shows considerable interspecific variation; the number of teeth ranging from one to several. A simple (Text-fig. 256), comb-like or spatulate (Text-fig. 106) dorsal seta is present as well as two lyriform fissures. The fixed digit in certain males is truncated distally, for example in *Pergamasus runciger* Berlese (Text-fig. 262) and *P. diversus* Halbert (Text-fig. 166). The spermadactyl is simple and fused with the movable digit distally (Text-fig. 206). The processes of the arthrodial membrane at the base of the movable digit may be simple or branched (Text-figs. 247 & 185) ; branched processes being rare in the females.

The ontogenetic development of the dentition of the digits of the chelicerae in *Pergamasus robustus* (Oudems.) is shown in Text-figures 1, 2 and 3. It will be noted that in *P. robustus* the dentition of the movable digit is constant throughout the



FIGS. 1–5. Figs. 1–3, Chelicerae of the larva (fig. 1), protonymph (fig. 2), and deutonymph (fig. 3) of *Pergamasus* (*Paragamasus*) *robustus* (Oudemans). Figs. 4 and 5. Gnathosoma of the larva (fig. 4) in *Pergamasus* (*Pergamasus*) *septentrionalis* (Oudemans) and (fig. 5) in *Pergamasus* (*Paragamasus*) *robustus* (Oudemans).

post-embryonic developmental stages. In *P. septentrionalis* (Oudems.), on the other hand, there is a progressive addition of teeth to the digit up to the deutonymph. The dorsal seta is constant in form throughout ontogeny.



FIGS. 6–10. Figs. 6–8 : Gnathosoma of the protonymph (fig. 6) of *Pergamasus* (*Paragamasus*) *robustus* (Oudemans), protonymph (fig. 7) of *Pergamasus* (*Pergamasus*) *septentrionalis* (Oudemans) and deutonymph (fig. 8) of *Pergamasus* (*Paragamasus*) *robustus*. Figs. 9–10 : Tectum of the protonymph (fig. 9) and deutonymph (fig. 10) of *P.* (*P.*) *robustus*.

Gnathosomal base, hypostome, tectum and pedipalps

The gnathosomal base and hypostome are well developed. The chaetotaxy of the venter of the hypostome comprises three setae in the larva, one of which has hypertrophied to form horn-like corniculi. The other two setae (gs.1 and gs.2) are simple or slightly pilose (Text-figs. 4 & 5). In the protonymph two pairs of setae are added, namely gs.3 on the venter of the hypostome and gs.4 on the gnathosomal base (Text-figs. 6 & 7). This chaetotaxy is retained in the deutonymph (Text-fig. 8) and adult (Evans, 1957). Setae gs.2 and gs.3 normally form a more or less transverse row between gs.1 and gs.4 ; the exception occurs in some males, where gs.3 lies anterior to gs.2. The corniculi in females and immature stages are sessile but in males they are borne on stalk-like projections of the hypostome which bear the hypostomal setae (Text-fig. 102). The hypostomal processes are strongly developed and show interspecific differences. Their external margins are invariably fringed with setae-like processes.

The deutosternum in the adults bears eight to fifteen transverse rows of denticles. There are no deutosternal denticles in the larva. With few exceptions the number of rows of denticles is constant in the protonymph, deutonymph and adult of a given species.

The tectum in the adults is usually produced into three distinct prongs although this number may be increased to five or more in the neotrichous species. The form of the tectum is often markedly dissimilar in different post-embryonic stages of a species (Text-figs. 9 & 10).

The pedipalp has five free segments excluding the apotele which is represented by a three-tined seta-like structure on the inner basal angle of the tarsus. The chaetotaxy of the palp is an important taxonomic criterion both as regards the number of setae and their form. The palpal chaetotactic formulae are as follows (Text-figs. 11–13) :—

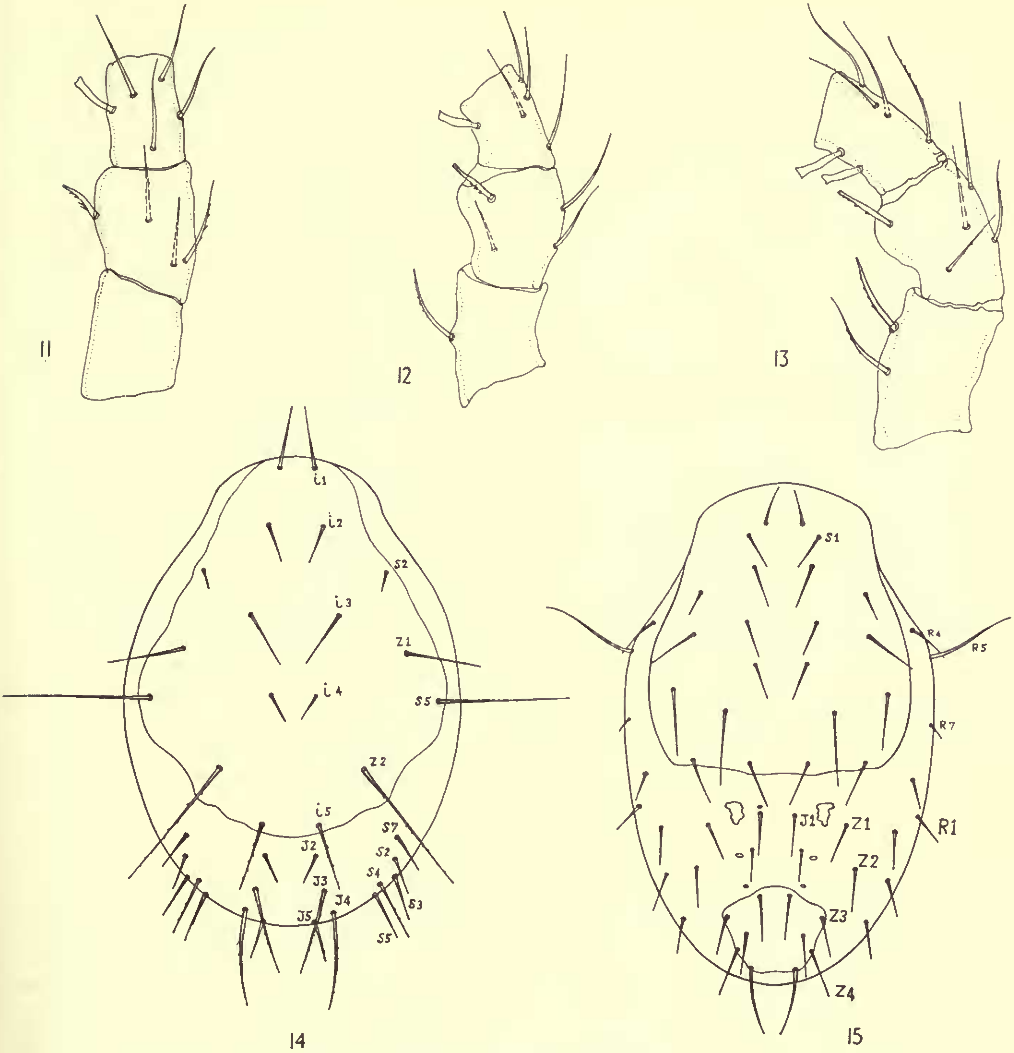
Larva (0–4–5–12–11–apotele).
Protonymph (1–4–5–12–15–apotele).
Deutonymph and adult (2–5–6–14–15–apotele).

In certain males the palp trochanter has one or two ventral protuberances ; the larger protuberance always bears a seta. Forms with two protuberances have the proximal one considerably smaller than the distal (Text-fig. 195). The seta on the internal (anterior) face of the femur is always comb-like whereas the two setae on the internal face of the genu may be spatulate or comb-like (Text-figs. 227 & 64). The other setae of these two segments may be simple or pilose.

Idiosoma

DORSUM

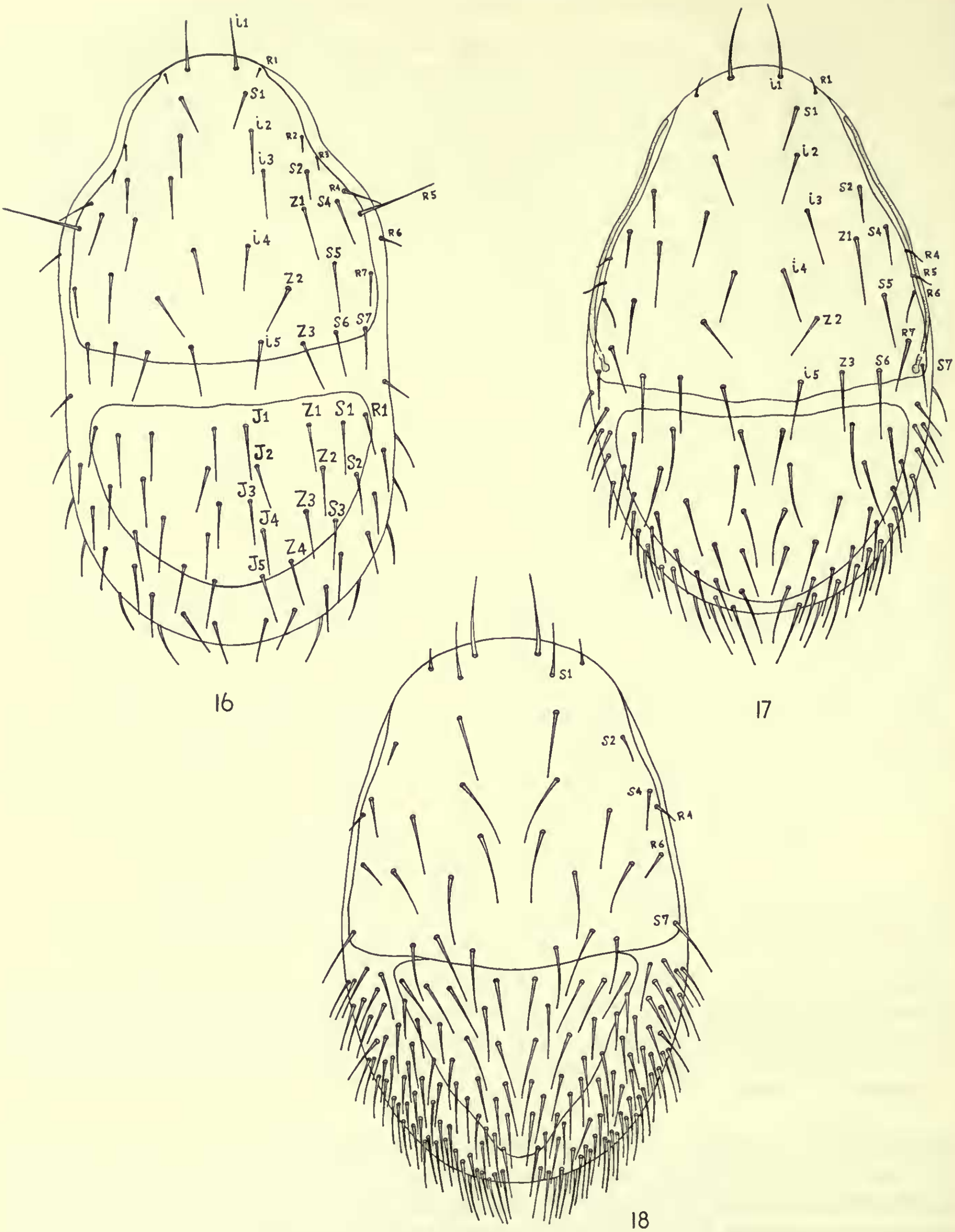
The dorsum of the larva has a well-defined podonotal shield bearing the normal nine pairs of setae (i1, i2, i3, i4, i5, z1, z2, s1 and s5). The unsclerotized cuticle posterior to the podonotal shield also carries nine setae comprising J2–J5, s7, S2–S5 (Text-fig. 14). In the protonymph, there are fifteen setae (including s7) in the podonotal region of which eleven setae are situated on the podonotal shield. The



FIGS. 11–15. Figs. 11–13 : Pedipalp of the larva (fig. 11), protonymph (fig. 12), and deutonymph (fig. 13) of *Pergamasus* (*Paragamasus*) *robustus* (Oudemans). Figs. 14 and 15 : Dorsum of the larva (fig. 14) and protonymph (fig. 15) of *Pergamasus* (*Paragamasus*) *robustus*.

setae added to this region of the dorsum in the protonymph are : s1, s6, r4, r5 and r7 (Text-fig. 15). Fourteen pairs of setae occur on the opisthonotal region of which four or five pairs may be situated on a small, weakly sclerotized opisthonotal shield (Text-fig. 15). Setae J1, Z1–Z4 and R1 are added at this stage. Mesonotal scutellae may be present or absent.

I have observed three types of chaetotaxy of the podonotal region in deutonymphs depending on the number of setae in the r series. In *P. robustus* twenty-one setae



FIGS. 16–18. Dorsum of the deutonymph of *Pergamasus* (*Paragamasus*) *robustus* (Oudemans) (fig. 16), *Pergamasus* (*Pergamasus*) *crassipes* (L.) Berlese (fig. 17) and *Pergamasus* (*Pergamasus*) *septentrionalis* (Oudemans) (fig. 18).

are present in this region with the r series (r1–r7) complete (Text-fig. 16). *P. crassipes*, on the other hand, has nineteen setae, r2 and r3 being absent (Text-fig. 17) and *P. septentrionalis* only seventeen setae, r2, r3, r5 and r7 being absent (Text-fig. 18). There are probably more than these three types I have observed, particularly amongst the species showing neotrichy of the podonotal region in the adult, for example *Pergamasus mirabilis* Willmann and *Pergamasus hamatus* (Koch), but I have not seen deutonymphs of these species. The deutonymphal opisthonotal shield is invariably well-defined and in the *Paragamasus*-group bears twelve or thirteen pairs of setae. The thirteen setae present on the opisthonotal shield of *P. robustus*, for example, are J1–J5, Z1–Z4, S1–S3 and R1 (Text-fig. 16). Neotrichy affects the unsclerotized cuticle of the opisthonotal region and the opisthonotal shield of members of the *Pergamasus*-group (Text-figs. 17 & 18) to such an extent that it is not possible to distinguish the primary setae.

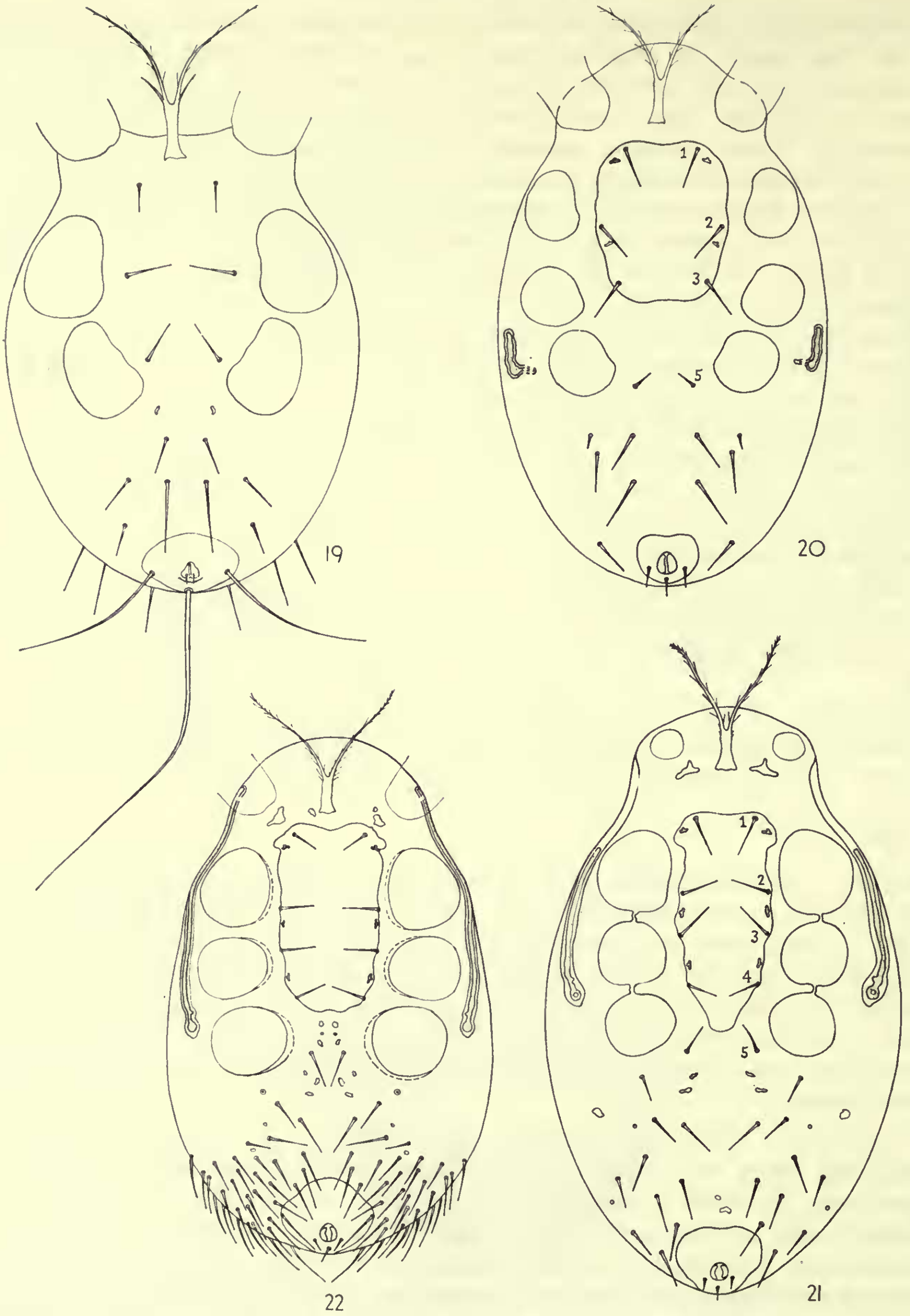
The dorsal chaetotaxy of the deutonymph of the *Paragamasus* group is retained by the adult and there is a fusion of the podonotal and opisthonotal elements to form an entire dorsal shield (Text-fig. 103). In the males of some species the line of fusion of these two sclerites is discernible (Text-fig. 96). The fusion of the deutonymphal podonotal and opisthonotal shield also occurs in the neotrichous *Pergamasus*-group and setae appear to be added to the dorsum at the deutonymphal ecdysis. The neotrichy is usually restricted to the opisthonotal region although in *P. hamatus* and *P. mirabilis* the podonotal region is also involved (Text-figs. 88 & 76).

The surface of the dorsal shield or shields is usually regionally reticulated and provided with numerous pore-like structures. The dorsal setae are usually simple although some pilose setae occur in immature and adult stages.

Venter

Larva : The tritosternum in the larva has a rectangular base, longer than wide and a pair of pilose laciniae (Text-fig. 19). The sternal region bears three pairs of simple or pilose setae but there is no definite indication of a sternal shield. All the species have a well-defined anal shield with the normal complement of setae, namely, a pair of paranals and a post-anal seta. These setae are invariably long. Each anal valve is provided with an euanal seta. The remainder of the opisthogastric region carries four pairs of setae distributed as in the Text-figure 19. There are no stigmata or peritremes.

Protonymph : The tritosternum is essentially the same as in the larva. The inter-coxal region bears four pairs of setae of which the anterior three pairs, homologous with the three sternal setae in the larva, are situated on a sternal shield provided with two pairs of lyriform fissures (Text-fig. 20). The remaining pair of setae situated between coxae IV is homologous with the genital setae of the adult. The anal shield bears the three setae present in the larva but these are considerably shorter in length. There are no euanal setae. The chaetotaxy of the remainder of the opisthogastric region shows an increase of one pair of setae which is located lateral to the anal shield. A pair of stigmata and short peritremes are present.



FIGS. 19–22. Venter of the larva (fig. 19) of *Pergamasus* (*Paragamasus*) *robustus* (Oudemans), protonymph (fig. 20) of *Pergamasus* (*Pergamasus*) *crassipes* (L.) Berlese, deutonymph (fig. 21) of *P.* (*P.*) *robustus* and deutonymph (fig. 22) of *P.* (*P.*) *crassipes*.

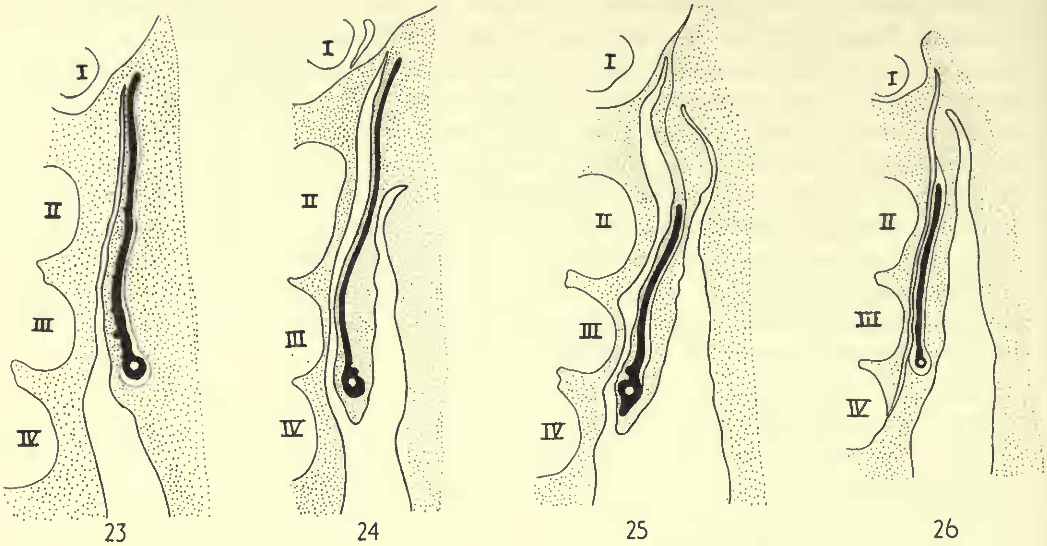
Deutonymph : The tritosternum is similar to that of the protonymph but is invariably flanked by one or more pairs of prae-endopodal shields. The inter-coxal region carries five pairs of setae ; those additional to the protonymphal complement being setae IV (the metasternals). Sternal setae I–IV are situated on a well-sclerotized sternal shield (Text-fig. 21). The anal shield is essentially the same as in the protonymph although in the *Pergamasus*-group some of the opisthogastric setae may be located on the shield. In the *Paragamasus*-group, unsclerotized cuticle of the opisthogastric region bears eight, nine or ten pairs of setae (Text-fig. 21), but in the *Pergamasus*-group neotrichy occurs particularly in the posterior region of the opisthogaster (Text-fig. 22). Both groups have well developed stigmata, peritremes and peritrematal shields. The length of the peritreme varies interspecifically. Small sclerites are often present on the opisthogaster.

Female : The tritosternum resembles that of the immature stages although the pilosity of the laciniae may be indistinct in some species. The prae-endopodal shields are well-defined in all the species examined but there is considerable interspecific variation in their shape, size and number. All species have a sternal shield bearing three pairs of setae and two pairs of lyriform fissures. The sternal shield is fused with the exopodal shields between coxae I and II and with the endopodal shields in the region of coxae II and III. Its posterior margin is often deeply incised medially and its surface may be variously ornamentated with a network of lines or punctures. The metasternal setae are situated on large discrete metasternal shields which are fused with the endopodal elements in the region of coxae IV and flank the triangular genital shield. Rarely, the metasternal shields are weakly fused along the median line. They bear a pair of lyriform fissures.

The genital shield is large and with the exception of *Paragamasus suecicus* (Trägårdh) (Plate 7l) is broadly triangular in outline. It bears a pair of genital setae. The anterior portion of the shield is strengthened by more heavily sclerotized areas whose outlines are of taxonomic importance (Plate 7b and Plate 8d). The genital shield overlies the genital orifice and a pair of sclerites (paragynials) referred to as " nymphae " by Berlese (1906). The wall of the vagina is variously sclerotized, the sclerotization being in the form of endogynial processes (Text-fig. 70, 118). Some species also have a pair of horn-like structures extending beneath the metasternal shields.

The opisthogastric shield is large and is fused with the podal elements in the region of coxae IV. The anus is subterminal and paired paranal and the post-anal setae are always present. In the *Paragamasus*-group (Text-figs. 264, 217) the opisthogastric shield bears eight, nine or ten (Text-figs. 213, 123, 117) pairs of setae excluding those associated with the anus, whereas the number is markedly increased in the neotrichous species of the *Pergamasus*-group (Text-figs. 36 & 57).

The stigmata and peritremes are conspicuous ; the length of the peritreme shows interspecific variation. The peritrematal shield shows varying degrees of fusion with the dorsal shield and the opisthogastric shield. In *Pergamasus crassipes* (Linn.), *P. longicornis* (Berl.), *P. septentrionalis* (Oudems.) and *P. quisquiliarum* (Can.), the shield is completely fused with the dorsal shield (Text-fig. 23). In

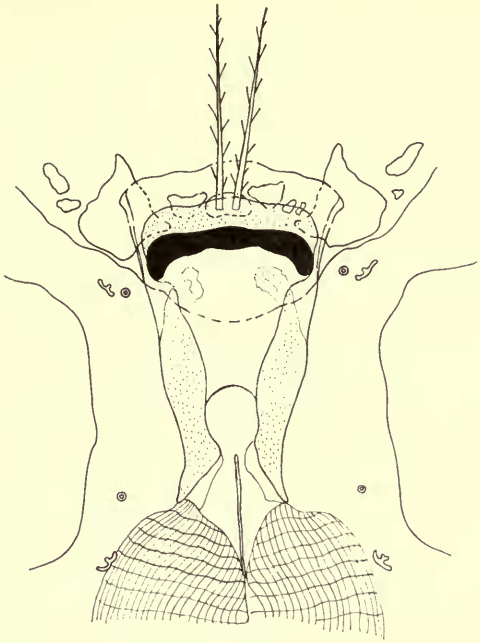


FIGS. 23–26. Peritrematal shields of females.
Fig. 23 *Pergamasus* (*Pergamasus*) *longicornis* Berlese, fig. 24 *Pergamasus* (*Pergamasus*) *hamatus* (Koch), fig. 25 *Pergamasus* (*Paragamasus*) *diversus* Halbert and fig. 26 *Pergamasus* (*Paragamasus*) *alstoni* sp. nov.

P. hamatus (Koch) and *P. hortensis* sp. nov. the extent of fusion with the dorsal shield is less ; the shield being free in its posterior half (Text-fig. 24). In the *Paragamasus*-group the shield is free (Text-fig. 25) or fused with the opisthogastric shield posteriorly (Text-fig. 26).

The unsclerotized cuticle of the opisthogastric region is provided with a variable number of setae.

Male : The dorsal, lateral and ventral surfaces of the idiosoma in the male are completely sclerotized except at the junction of the exo- and endopodal shields, between coxae II and III, and III and IV. The genital orifice is situated immediately anterior to the sternal shield and its ventral wall is strongly sclerotized (Text-fig. 27). The orifice is protected by a genital lamina whose anterior margin may be produced into one or two processes. The lamina is connected by a pair of elongate apodemes to strong retractor muscles and it is assumed that the lamina is capable of being withdrawn into the orifice. The base of the tritosternum, covered by the lamina, is strongly reduced but the pilose laciniae resemble those of the female. Prae-endopodal shields are invariably present. The chaetotaxy of the venter of the male resembles that of the females of the same species. Sternal seta 5 (the genital) may be situated near (*P. diversus, P. alpestris*) or on (*P. lapponicus, P. teutonicus*) scale-like tubercles (Text-figs. 163, 193). The peritrematal shields (including the stigmata and peritremes) are entirely fused with the dorsal shield and the exopodals. A post-stigmatic seta may or may not be present.



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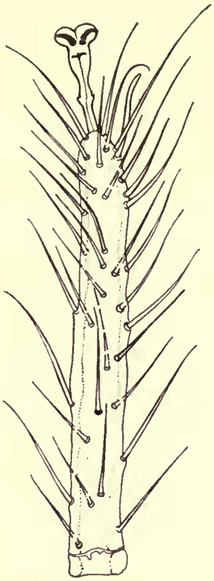

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FIGS. 27–28. *Pergamasus* (*Paragamasus*) *lapponicus* Trägårdh, male.
Fig. 27 internal view of the sterniti-genital region. Fig. 28 tarsus and prae-tarsus of leg I.

Legs

The legs are six segmented (excluding the ambulacrum) in all post-embryonic developmental stages. Lyriform fissures occur in the basal half of the femora and tarsi, and result in false divisions of these segments. All the segments of the legs have a well-defined chaetotaxy which has been studied in detail by Evans (1963) whose terminology I have adopted. The chaetotaxy of each instar shows little or no intra or interspecific variation in setal complement although the relative lengths and form of the setae may vary. Leg II in the male is specialised for grasping the female during mating which, as in the majority of the Mesostigmata, is an indirect method involving a spermatophore. Leg II is often enlarged (crassate) and two setae (v_2 and v_3) on the femur and one on the genu (av_1) and the tibia (av_1) hypertrophy and form spur-like structures. The form of the spurs on these segments is of taxonomic importance. A dorsal seta on the basal half of tarsus IV is invariably long and erect. The ambulacrum comprises a lobed pulvillus and two claws (Text-fig. 28).

CLASSIFICATION

The *Paragamasus*-group is at present, divided into four subgenera. According to Hull (1918) these subgenera may be characterized as follows:—

1 'Body of both sexes piriform, rostrum very prominent, cuticle polished and smooth, Femur II of male crassate but spurless. Colour ruddy brown' . . . . *Amblygamasus* Berlese.

2 ' Body of both sexes piriform, cuticle conspicuously reticulate and rather rough. Femur II crassate with a strong falcate spur ; patella with a prominent apical spur or branch projecting inwards and forwards. Colour ruddy brown, rather dull ' . . . . *Pergamasus* s. str.

3 ' Body oblong, more or less parallel sided in both sexes. Ped II as in (2) but without the patellar spur. Colour pale yellowish brown ' *Paragamasus* Hull.

4 ' Body of male narrow, oblong, of female rather piriform. Ped II of the male only slightly crassate all spurs more or less cylindrical. Colour very pale ' *Plesiogamasus* Hull.

The validity of Hull's subdivision of the genus must be assessed on the basis of the characters associated with leg II of the male since those based on the shape of the idiosoma and its colour are less reliable ; being subjected to considerable intraspecific variation. His reference to the armature of the patella is confusing. Assuming that his " patella " refers to the genual segment, then the prominent apical spur on leg II of *P. crassipes* (the type of the subgenus *Pergamasus*) is not located on that segment but on the tibia whereas in *P. alpestris*, which Hull includes in *Pergamasus* s. str., the characteristic L-shaped process is present on the genu. Thus, Hull's use of the armature of the patella in separating *Pergamasus* and *Paragamasus* has no foundation. Further, the statements that members of *Paragamasus* have no patellar spur is also inaccurate, the only British species of the genus without a spur on genu II are *P. quisquiliarum* and *P. diversus* and Hull considered that the latter should probably be placed in *Pergamasus* s. str.

The type species of *Paragamasus* Hull (type *Pergamasus robustus* (Oudemans)) and *Plesiogamasus* Hull (type *Pergamasus hamatus* (Koch) sensu Berlese, 1905) were designated by Turk & Turk (1952).

Within the limited number of species (thirty-two) I have examined the groupings formed on the basis of various combinations of external morphological characters indicate an intrageneric rather than an intergeneric relationship between the groups. The emphasis laid on the characters associated with leg II in the male in the classification at subgeneric level appears to be unwarranted. The nature of the armature of leg II does not appear to be correlated with any other distinctive morphological character and the degree of development of spurs (hypertrophied setae) and sclerotized protuberances show every gradation in form, from the weakly developed nodular spurs of *P. nathistmus* sp. nov. to the massive spurs and protuberances of *P. robustus* and *P. crassipes*.

The only character I have found which will give a reliable practical division of the genus is the chaetotaxy of the dorsum and the opisthogastric region of the idiosoma. Two groups are readily definable ; one in which the chaetotaxy displays neotrichy and the other in which neotrichy is not apparent. This character has the advantage over characters restricted to the male or female in being determined at the deutonymphal stage and of applying to both sexes. I have, provisionally, included the neotrichous species in the subgenus *Pergamasus* Berl. s. str. and the non-neotrichous species in *Paragamasus* Hull. These subgenera have the following characteristics :—

Family Parasitidae Oudemans

Genus ***PERGAMASUS*** Berlese, 1904 s. lat.

Type : ***Pergamasus crassipes*** (Linn.) Berlese, 1906.

Subgenus ***Pergamasus*** s. str.

(including *Amblygamasus* Berl. and *Plesiogamasus* Hull).

The chaetotaxy of the dorsum and of the opisthogastric region of the idiosoma displays neotrichy in all the members of this subgenus. With the exception of *P.* (*P.*) *hamatus*, neotrichy of the dorsal chaetotaxy is restricted to the opisthosomal region. Two distinct groups of species may be recognized on the basis of female characteristics, namely : the *crassipes*-group (*P.* (*P.*) *crassipes* and *P.* (*P.*) *longicornis ;* *P.* (*P.*) *septentrionalis* and *P.* (*P.*) *quisquiliarum*) in which the peritrematal shield is entirely fused with the dorsal shield in the region of coxae II–IV and the tectum is essentially five-pronged ; and the *hamatus*-group (*P.* (*P.*) *hamatus* and *P.* (*P.*) *hortensis*) in which the peritrematal shield is free posteriorly and the tectum is essentially three-pronged. The female of *P.* (*P.*) *mirabilis* is not known.

Members of the *crassipes*-group are large (up to 1,383μ), strongly sclerotized species ; the males of which may be readily distinguished by the armature of leg II and the form of the internal setae of the genu of the pedipalp and of the dorsal seta of the chelicera. The form of the sclerotized structures of the endogynium is characteristic for the females.

The seven British species which I have assigned to this subgenus are keyed below.

Subgenus ***Paragamasus*** Hull, 1918

(including *Leptogamasus* Trägårdh)

Type: ***Pergamasus robustus*** (Oudemans, 1902)

The majority of the British species of *Pergamasus* fall into this subgenus. There are never more than thirty-five pairs of setae on the opisthonotal region of the dorsal shield and the setae of the opisthogastric shield in the female number eight, nine or ten (excluding the three setae associated with the anus). The species range in length from 400–1,200μ. The dorsal shield in the male often shows an incomplete fusion of the podonotal and opisthonotal elements ; their juncture being indicated by a transverse suture. The tectum is basically three-pronged throughout. The separation of the males has been made largely on the armature of leg II, the form and chaetotaxy of the trochanter of the pedipalp, the shape and dentition of the chelicera and the chaetotaxy of the dorsum. The females show greater morphological homogeneity and although it has been possible to divide them into groups on the basis of such characters as the fusion of the peritrematal shield with the opisthogastric shield, the number of setae on the opisthogastric shield and the chaetotaxy of the dorsal shield, specific diagnosis in a number of cases depends on the form of the genital shield and the endogynial processes. The characters associated with the genital shield and endogynium are so difficult to define for key purposes that for identification purposes it will be necessary to remove the genital shield and compare its structure with the illustrations.

KEY TO ADULTS OF THE BRITISH MITES OF THE GENUS *Pergamasus* BERL. S. LAT.

MALES

1 Opisthonotal region with a dense covering of setae, more than 45 pairs (Text-fig. 82) (Subgenus ***Pergamasus***) 2

– Opisthonotal region with a moderate covering of setae, not more than 35 pairs (Text-fig. 152) . . . . (Subgenus ***Paragamasus***) 7

2 Chaetotaxy of the podonotal region displaying neotrichy, more than 45 pairs of setae present (Text-fig. 82) ; femur II with two spurs (Plate 2c) ; dorsal shield with a distinct transverse suture indicating the juncture of the podonotal and opisthonotal shields . . . . . ***P. (Pergamasus) hamatus*** (Koch) (p. 169)

– Chaetotaxy of the podonotal region not displaying neotrichy, 25–27 pairs of setae present (Text-fig. 76) ; femur II with at the most a single spur (Plate 1a) . . 3

3 Dorsum with a transverse suture (Text-fig. 76) ; coxa II with processes (Plate 2a) ; tibia II unarmed (Plate 2b) ; prae-endopodal shields almost meeting in the mid-line ; genital lamina weakly developed . ***P. (Pergamasus) mirabilis*** Willmann (p. 166)

– Dorsum without a transverse suture (Text-fig. 50) ; coxa II unarmed ; tibia II armed with one or more spur-like processes ; prae-endopodal shields widely separated 4

4 Internal setae of the genu of the pedipalp spatulate, entire ; tibia of leg II with a large ventro-lateral process (Plate 1b) ; dorsal seta of the chelicera simple . 5

– Internal setae of the genu of the pedipalp denticulate distally (Text-fig. 64) ; tibia II without such large process (Plate 1e) ; dorsal seta of the chelicera denticulate distally (Text-fig. 65) 6

5 Ventro-lateral process of tibia II hook-like distally (Plate 1b) ***P. (Pergamasus) longicornis*** Berlese (p. 155)

– Ventro-lateral process of tibia II rounded distally (Plate 1a) ***P. (Pergamasus) crassipes*** (L) Berlese (p. 151)

6 Genu II strongly spurred (Plate 1c) ; femur II without spur ; genital lamina produced into a median spine (Text-fig. 51) ***P. (Pergamasus) septentrionalis*** (Oudemans) (p. 159)

– Genu II unarmed (Plate 1d) ; femur II with a truncated spur ; genital lamina may be medially incised (Text-fig. 62) ***P. (Pergamasus) quisquiliarum*** (Canestrini) (p. 163)

7 Dorsum entire, without transverse suture (Text-fig. 235) 8

– Dorsum with a transverse suture (Text-fig. 239) 13

8 Coxa and trochanter of leg II tuberculated (Plate 2e & f) ; movable digit of the chelicera bidentate (Text-fig. 113), fixed digit truncate distally ; with scale-like elevations near sternal setae V (Text-fig. 110) ***P. (Paragamasus) alpestris*** Berlese (p. 178)

– Coxa and trochanter of leg II not tuberculated ; movable digit of the chelicera uni- or bidentate, fixed digit rounded distally (Text-fig. 251) without scale-like elevations near sternal setae V 9

9 Dorsal shield greater than 700μ in length 10

– Dorsal shield less than 500μ in length 11

10 Dorsal seta R5 about twice the length of S4 (Text-fig. 203) : spur on tibia II in the form of a ridge (Plate 4e) . . ***P. (Paragamasus) leruthi*** Cooreman (p. 204)

– Dorsal setae R5 and S4 subequal in length (Text-fig. 181) ; spur on tibia II digitiform (Plate 4b) . . . . . . ***P. (Paragamasus) integer*** sp. nov. (p. 197)

11 Fixed digits of the chelicera tapering distally, not hooked ; movable digit unidentate (Text-fig. 282) . . . . . ***P. (Paragamasus) suecicus*** (Trägårdh) (p. 228)

– Fixed digit of chelicera hooked distally ; movable digit bidentate (Text-fig. 251) . 12

12 Spurs on femur II minute, main spur scarcely longer than the accessory spur (Plate 5b) . . . . **P. (Paragamasus) nathistmus** sp. nov. (p. 214)

– Spurs on femur II larger, main spur about twice the length of the accessory spur (Plate 5f) . . . . . **P. (Paragamasus) rothamstedensis** sp. nov. (p. 219)

13 Corniculus with triangular hyaline appendage (Text-fig. 167) ; genu II unarmed (Plate 3b) . . . . . . **P. (Paragamasus) diversus** Halbert (p. 192)

– Corniculus without such appendage ; genu II armed with a spur 14

14 Trochanter of pedipalp without seta-bearing tubercle (Text-fig. 99) 15

– Trochanter of pedipalp with a strong seta-bearing proximal tubercle (Text-fig. 195) 16

15 Trochanter II spurred (Plate 2d) . **P. (Paragamasus) robustus** (Oudemans) (p. 174)

– Trochanter II not spurred ; leg II figured (Plate 6d) **P. (Paragamasus) truncus** Schweizer (p. 234)

16 Sternal seta V arising from a scale-like elevation (Text-fig. 193) 17

– Sternal seta V not arising from a scale-like elevation 18

17 Trochanter II with a strong spur-like projection (Plate 4c) ; leg II (Plate 4d) ; trochanter IV with process (Text-fig. 197) **P. (Paragamasus) lapponicus** Trägårdh (p. 200)

– Trochanter II without such projection ; leg II (Plate 6c) ; trochanter IV without process . . . . . **P. (Paragamasus) teutonicus** Willmann (p. 231)

18 Femur II with a conspicuous tubercle proximal to the lyriform fissure (Plate 4a) ; anterior rows of deutosternal denticles strongly arched (Text-fig. 180) ; leg II figured (Plate 4a) . . . . **P. (Paragamasus) femoratus** sp. nov. (p. 197)

– Femur II without tubercle proximal to lyriform fissure 19

19 Dorsal shield 500μ or less in length ; main spur on femur II considerably shorter than the length of tibia II (Plate 6d) 20

– Dorsal shield 700μ or greater in length ; main spur on femur II about equal in length to or longer than tibia II (Plate 3g) 22

20 Femur II with a strong sclerotized ridge proximal to the main spur (Plate 6e) ; spur on tibia slender . . **P. (Paragamasus) wasmanni** (Oudemans) (p. 237)

– Femur II without sclerotized ridge proximal to the main spur (Plate 5a) ; spur on tibia II broad 21

21 Proximal seta on the trochanter of the pedipalp about equal to the height of the tubercle (Text-fig. 138) ; leg II (Plate 3a) **P. (Paragamasus) cambriensis** sp. nov. (p. 186)

– Length of the proximal seta on the trochanter of the pedipalp about twice the height of the tubercle (Text-fig. 227) ; leg II (Plate 5a) **P. (Paragamasus) misellus** Berlese (p. 211)

22 Accessory spur on femur II broad, truncate (Plate 5c) 23

– Accessory spur on femur II slender, tapering distally (Plate 6a) 25

23 Main spur on femur II slender without tubercle (Plate 3d) ; trochanter II with sclerotized process distally (Plate 3c) ; leg II (Plate 3d) **P. (Paragamasus) cassiteridum** sp. nov. (p. 188)

– Main spur on femur II with distinct tubercle (Plate 5g) ; trochanter II without sclerotized process distally 24

24 Trochanter of pedipalp with a distinct tubercle proximal to the seta-bearing tubercle (Text-fig. 242) ; leg II (Plate 5c) . **P. (Paragamasus) parrunciger** sp. nov. (p. 216)

– Trochanter of pedipalp without tubercle proximal to the seta-bearing tubercle (Text-fig. 261) ; leg II (Plate 5g) . **P. (Paragamus) runciger** (Berlese) (p. 222)

25 Fixed digit of the chelicera markedly broad anterior to the lyriform fissure (Text-fig. 156) ; leg II (Plate 3g) . . . **P. (Paragamasus) celticus** sp. nov. (p. 192)

– Fixed digit of the chelicera relatively slender (Text-fig. 131) ; leg II (Plate 2g) . 26

26 Trochanter of pedipalp with a distinct tubercle proximal to the seta-bearing tubercle (Text-fig. 270) ; spurs on leg II as in Plate 6a
P. (Paragamasus) schweizeri sp. nov. (p. 225)

– Trochanter of pedipalp without tubercle proximal to the seta-bearing tubercle (Text-fig. 130) ; spurs on leg II as in Plate 2g
P. (Paragamasus) armatus Halbert (p. 183)

FEMALES

1 Opisthonotal region of dorsal shield with a moderate covering of setae, never more than 35 pairs (Text-fig. 134) ; peritrematal shield free posteriorly or fused with the opisthogastric shield (Text-figs. 141 & 123) ; opisthogastric shield with a maximum of ten pairs of setae, excluding the three setae associated with the anus . . . . (Subgenus ***Paragamasus***) 7

– Opisthonotal region of dorsal shield with a dense covering of setae, more than 45 pairs (Text-fig. 55) ; peritrematal shield fused with the dorsal shield along its entire length or free in its posterior half (Text-figs. 47 & 93) ; opisthogastric shield with never less than 14 pairs of setae (Text-fig. 47)
(Subgenus ***Pergamasus***) 2

2 Podonotal region of the dorsal shield neotrichous with more than 35 pairs of setae (Text-fig. 88) ; peritrematal shield free in its posterior half (Text-fig. 24) ; tectum three-pronged (Text-fig. 90) . ***P. (Pergamasus) hamatus*** (Koch) (p. 169)

– Podonotal region of the dorsal shield with never more than 25 pairs of setae (Text-fig. 35) ; peritrematal shield fused with the dorsal shield along its entire length or free in its posterior half (Text-figs. 36 & 93) ; tectum basically three- or five-pronged (Text-figs. 95 & 72) 3

3 Tectum basically three-pronged (Text-fig. 95), peritrematal shield free in its posterior half (Text-fig. 93) ; endogynium characteristic (Text-fig. 94) ; dorsal shield 1,200μ in length . . . . . ***P. (Pergamasus) hortensis*** sp. nov. (p. 173)

– Tectum basically five-pronged (Text-fig. 38) ; peritrematal shield fused with the dorsal shield along its entire length ; large species, greater than 1,200μ in length 4

4 Endogynium with a pair of large horn-like structures (Text-fig. 56) ; no reticulated endogynial sacs ; trochanter IV with a sclerotized protuberance (Text-fig. 60)
P. (Pergamasus) septentrionalis (Oudemans) (p. 159)

– Endogynium without paired horn-like structure but with a pair of reticulated sacs separated by a median process (Text-fig. 70) ; trochanter IV without sclerotized protuberance 5

5 Internal setae of the genu of the pedipalp denticulate distally (Text-fig. 74) ; dorsal seta of the chelicera denticulate distally (Text-fig. 73) ; opisthogastric shield with twenty or more pairs of setae excluding the anals (Text-fig. 68)
P. (Pergamasus) quisquiliarum (Can.) (p. 163)

– Internal setae of the genu of the pedipalp spatulate ; entire dorsal seta of the chelicera simple (Text-fig. 49) ; opisthogastric shield with about 15 pairs of setae (Text-fig. 36) 6

6 Median process of endogynium strongly bifurcate distally (Text-fig. 47) ; genital shield as in Plate 7b . . . . . ***P. (Pergamasus) longicornis*** Berl. (p. 155)

– Median process of endogynium entire (Text-fig. 37) ; genital shield as in Plate 7a
P. (Pergamasus) crassipes (L) Berl. (p. 151)

7 Peritrematal shield fused with the opisthogastric shield posteriorly (Text-fig. 284) ; with 9 pairs of opisthogastric setae (Text-fig. 284) 8

– Peritrematal shield free posteriorly (Text-fig. 25) ; with 8 or 10 pairs of opisthogastric setae (Text-figs. 254 & 275) 10

8 Genital shield rounded anteriorly (Plate 7l) ***P. (Paragamasus) suecicus*** Trägårdh (p. 228)

– Genital shield triangular anteriorly (Plate 7g) . . . .

9 Endogynial processes as in Text-fig. 210 **P. (Paragamasus) leruthi** Cooreman (p. 204)

– Endogynial processes as in Text-fig. 124 . **P. (Paragamasus) alstoni** sp. nov. (p. 181)

10 Opisthogastric shield with 8 pairs of setae excluding anals (Text-fig. 254) . . 11

– Opisthogastric shield with 10 pairs of setae excluding anals (Text-fig. 188) . . 12

11 Genital shield as in Plate 7k . **P. (Paragamasus) rothamstedensis** sp. nov. (p. 219)

– Genital shield as in Plate 7j . . **P. (Paragamasus) londonensis** sp. nov. (p. 207)

12 Dorsal setae R5 and S4 subequal in length (Text-fig. 187) ; genital shield and endogynial processes as in Plate 7i and Text-fig. 189 respectively **P. (Paragamasus) integer** sp. nov. (p. 197)

– Dorsal seta R5 considerably longer than S4 (Text-figs. 231 & 302) . . . 13

13 Small species 450–550μ in length ; peritreme extending to the middle of coxa II ;
Genital shield as in Plate 8a . . **P. (Paragamasus) misellus** Berlese (p. 211)
Genital shield as in Plate 8e . **P. (Paragamasus) wasmanni** (Oudemans) (p. 237)
Genital shield as in Plate 8b . . **P. (Paragamasus) truncus** Schweizer (p. 234)
Sterniti-genital region as in Text-fig. 222 **P. (Paragamasus) minimus** sp. nov. (p. 211)
Genital shield as in Plate 8d . . **P. (Paragamasus) cambriensis** sp. nov. (p. 186)

– Large species 700–1,200μ in length ; peritreme usually extending beyond coxa II . 14

14 Large species, dorsal shield 1,100–1,200μ in length 15

– Smaller species, dorsal shield usually 700–800μ in length (except **P. (Paragamasus) longisetosus**, 975–1,000μ) 16

15 Endogynial processes and genital shield as in Text-fig. 104 and Plate 7e respectively ; peritreme extending to the middle of coxa II **P. (Paragamasus) robustus** (Oudemans) (p. 174)

– Endogynial processes and genital shield as in Text-fig. 118 and Plate 7f respectively **P. (Paragamasus) alpestris** Berlese (p. 178)

16 Dorsal setae conspicuously long and thick (Text-fig. 216) ; species 975–1,000μ in length . . . . . **P. (Paragamasus) longisetosus** sp. nov. (p. 207)

– Dorsal setae relatively shorter and never thickened ; less than 900μ in length . 17

17 Posterior incision of the sternal shield extending to the level of sternal setae II (Text-fig. 170) ; genital shield with an anterior arrow-like sclerotized area (Plate 7h) **P. (Paragamasus) diversus** Halbert (p. 192)

– Posterior incision of the sternal shield never reaching the level of sternal setae II ; genital shield without such sclerotized area

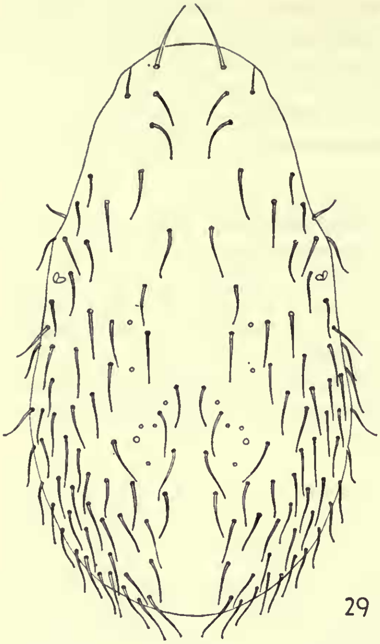
a Genital shield as in Plate 8k . . . **P. (Paragamasus) runciger** Berlese(p. 222)
b Genital shield as in Plate 8j . . **P. (Paragamasus) parrunciger** sp. nov. (p. 216)
c Genital shield as in Plate 8c . . . **P. (Paragamasus) armatus** Halbert (p. 183)
d Genital shield as in Plate 8h & i . **P. (Paragamasus) lapponicus** Träg. (p. 200)
e Genital shield as in Plate 8m & n . **P. (Paragamasus) teutonicus** Willmann (p. 231)
f Genital shield as in Plate 8f & g . . **P. (Paragamasus) celticus** sp. nov. (p. 192)
g Genital shield as in Plate 8l . . **P. (Paragamasus) schweizeri** sp. nov. (p. 225)

Pergamasus (Pergamasus) crassipes (L) Berlese

Gamasus (*Pergamasus*) *crassipes :* Berlese A (1906) *Redia* **3** : 229 (male only).
Gamasus (*Pergamasus*) *crassipes var. longicornis* Berlese (1906) *Redia* **3** : 232 (female only).

MALE. The male is ruddy brown in colour. The dorsal shield (1,268–1,383μ in length × 747–864μ wide) is pear-shaped, regionally reticulated, strongly sclerotized and without a transverse suture. The opisthosomal region is densely covered with setae (Text-fig. 29).

Ventrally, there are two large prae-endopodal shields flanking the genital sclerite. The tritosternum has a pair of well developed pilose laciniae. About half of the



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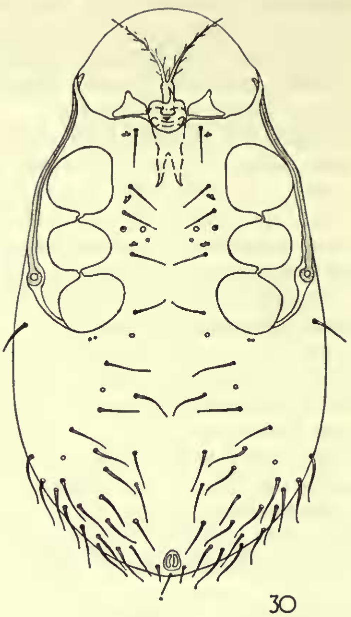

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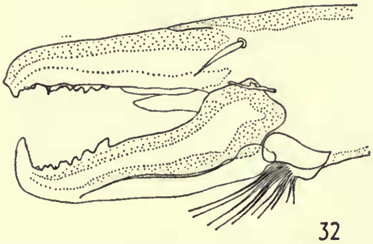

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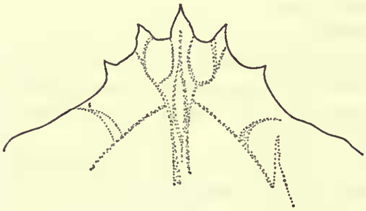

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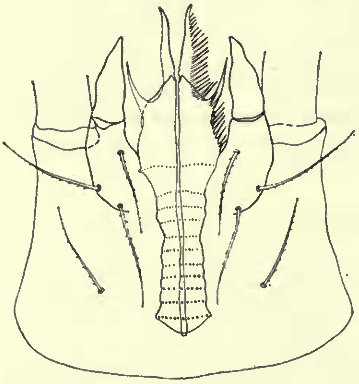

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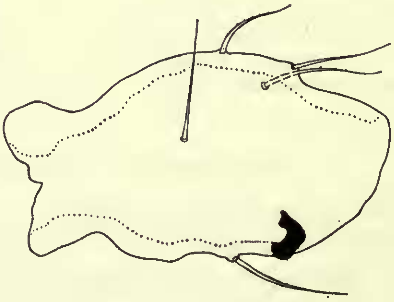

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FIGS. 29–34. *Pergamasus* (*Pergamasus*) *crassipes* (L.) Berlese, male.
Fig. 29 dorsum of idiosoma. Fig. 30 venter. Fig. 31 tectum. Fig. 32 chelicera. Fig. 33 venter of gnathosoma. Fig. 34 trochanter of leg IV.

tritosternum is covered by the genital lamina. The genital lamina is produced anteriorly into a sharply pointed spine. The arrangement of the sternal setae and pores are shown in Text-fig. 30.

The stigma is situated ventro-laterally between coxae III and IV ; the peritreme extends to coxa I. The post-stigmatal extension of the peritrematal shield reaches the posterior region of coxa IV. A pair of post-stigmatal setae is present.

The tectum is produced anteriorly into five short tooth-like processes (Text-fig. 31). The most distinctive features of the chaetotaxy of the pedipalp are, the comb-like seta on the femur and the spatulate setae on the genu. The palpal trochanter is without a tubercle. The chelicera is strong with a simple dorsal seta. The fixed digit is truncated. Both digits possess rows of teeth (Text-fig. 32). The spermadactyl is normal. The corniculus is distinctly stalked. The entire lateral (outer) margins of the hypostomal processes are fringed (Text-fig. 33). The hypostomal setae are pilose. The deutosternal teeth of the ventral groove are arranged in eleven transverse rows.

The tarsus (333–360μ) of leg I is longer than the tibia (254–266μ). The praetarsus is 19–25μ long. The femur of leg II is crassate with a strong falcate spur. The terminal end of the main process of the tibia is almost rounded and its distal spur is shown in Plate 1a. The trochanter of leg II is shown in Text-fig. 34.

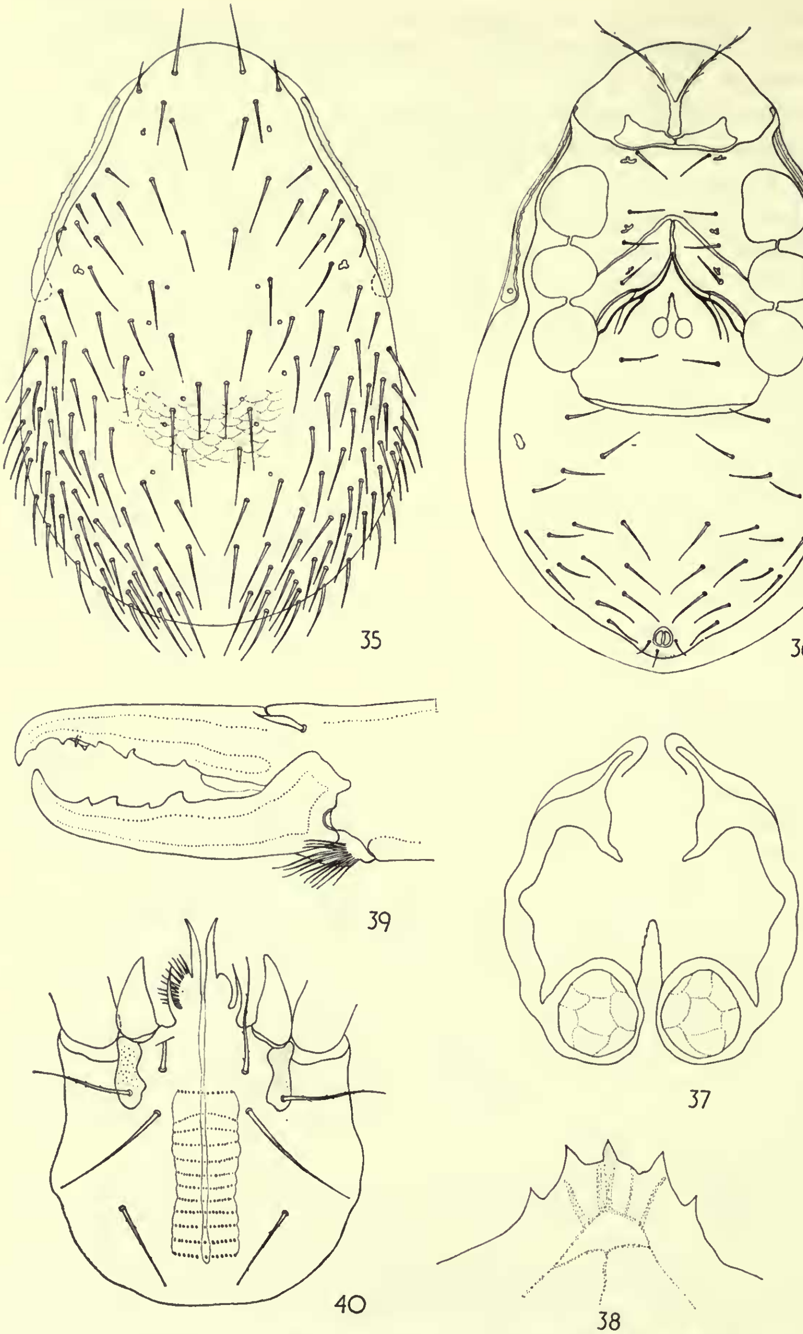
FEMALE. The dorsum of the dark brown, strongly sclerotized idiosoma is neotrichous (Text-fig. 35). The dorsal shield (1,200–1,351μ long × 782–917μ wide) is oval and regionally reticulated.

The tritosternum is well developed with a pair of pilose laciniae. There is a pair of prae-endopodal shields almost meeting in the medial line (Text-fig. 36). The metasternal shields are free. The endogynium is furnished with a pair of round faintly reticulated sacs with a short median process arising between them (Text-fig. 37). The terminal end of the process may be smooth or slightly serrated. The genital shield is shown in Plate 7a. The opisthogastric shield usually has fifteen pairs of setae of variable length (excluding the three setae associated with the anus). Ventrally the stigma is situated a little behind coxa III and the peritreme extends to coxa I. The peritrematal shield is fused with the dorsal shield.

The tectum is five-pronged (Text-fig. 38). The pedipalp is essentially the same as in the male. The dentition of the fixed digit is well shown in Text-fig. 39. Fringes are confined to the proximal portion of the hypostomal processes (Text-fig. 40). The deutosternal denticles are arranged in twelve transverse rows. The gnathosomal setae are distinctly pilose.

Leg I has the tarsus (342–404μ) longer than the tibia (241–291μ) ; the praetarsus is 25–29μ long. The trochanter of leg IV is without a process.

DISTRIBUTION AND HABITAT. I have examined material from : In litter under *Cupressus* sp. (Rothamsted Lodge, Rothamsted Experimental Station, Harpenden, Hertfordshire, G. Owen Evans and E. Browning, 18.iii.1957). In leaf mould (Forest of Dean, Gloucestershire, J. T. Salmon, 27.ix.1951). Oak and birch leaves (Newton Abbot, S. Devon, R. G. Lewesther, 21.vi.1951). Litter and humus under pines and holly (summit of Dove Crag, near Ambleside, Westmorland, M. E. Bacchus,



FIGS. 35–40. *Pergamasus* (*Pergamasus*) *crassipes* (L.) Berlese, female.
Fig. 35 dorsum of idiosoma. Fig. 36 venter. Fig. 37 endogynial process. Fig. 38 tectum. Fig. 39 chelicera. Fig. 40 venter of gnathosoma.

28.ii.1954). *Sphagnum*, etc. (Cock Hill, Yorkshire, J. T. Salmon, 21.vii.1951). In leaf mould (Epping Forest, Essex, J. T. Salmon, 27.v.1951). In leaf mould (Savernake Forest, Berkshire, J. T. Salmon, 26.ix.1951). In moss of wall (Tarn Hows, North Lancashire, M. E. Bacchus, 4.xii.1954). In moss (Grassington, Grass Woods, North Riding, Yorkshire, J. T. Salmon, 24.vi.1951). *Sphagnum* (Ascot, Berkshire, A. H. G. Alston, 8.xii.1957). Leaf litter from woods (near Buxton, Derbyshire, J. T. Salmon, 23.vi.1951). Moss on tree stumps and stones (Forest of Dean, Gloucestershire, J. T. Salmon, 27.ix.1951). In beech leaf mould from steep bank (Rickmansworth, Hertfordshire, M. E. Bacchus, 25.ii.1951). In leaf mould (Richmond Park, Surrey, J. T. Salmon, 19.iii.1951). In leaf mould (Burnham Beeches, Buckinghamshire, J. T. Salmon, 3.vi.1951). (Roy. Bot. Gdns., Kew, Surrey, J. L. Gilbert, —.iii.1961). Moss, humus, hollow tree (Swansea University, Swansea, P. N. Lawrence, 26.iii.1962). *Sphagnum*, etc. (Moel Siabod, North Wales, P. N. Lawrence, 22.x.1960). In moss (Tarbert, Crianlarich, Loch Lomond, Dunbarton, J. T. Salmon, 3.vii.1951). In dead leaves (Loch Lomond between Glasgow and Tarbert, Dunbarton, J. T. Salmon, 8.vii.1951).

BIOLOGICAL NOTES. Eggs from four females kept under laboratory conditions hatched within one to three days (average 2·16 days) of deposition. The eggs are densely covered with hair-like outgrowths. The larva is sluggish and does not feed. It moults in one to eight days (average 3·16) into an active feeding protonymph. The protonymphal stage lasts nine to thirteen days (average 10·0). The deutonymph is also active and feeding lasts seven to thirty-five days (average 24·22). Unlike *P.* (*P.*) *robustus*, males and females were reared from the egg batch laid by each female.

There is considerable confusion in the literature concerning the identity of *P.* (*P.*) *crassipes*. Berlese (1906) in his monograph describes and figures two forms, namely, *Gamasus* (*Pergamasus*) *crassipes* (L.) and *G.* (*P.*) *crassipes* var. *longicornis* Berlese. These two forms are readily distinguishable by the armature of the tibia of leg II in the male. Unfortunately, Berlese connected the wrong female and male; thus the female of *G.* (*P.*) *crassipes* : Berlese is really the female of *G.* (*P.*) *crassipes* var. *longicornis* Berlese. I have verified this by examining material in the Berlese Collection at Florence and by rearing *P.* (*P.*) *crassipes* in the laboratory. I consider the two " forms " to be distinct sympatric species which can be distinguished by a number of morphological characters. Owing to the confusion regarding the identity of these species, I have not attempted a full synonymy.

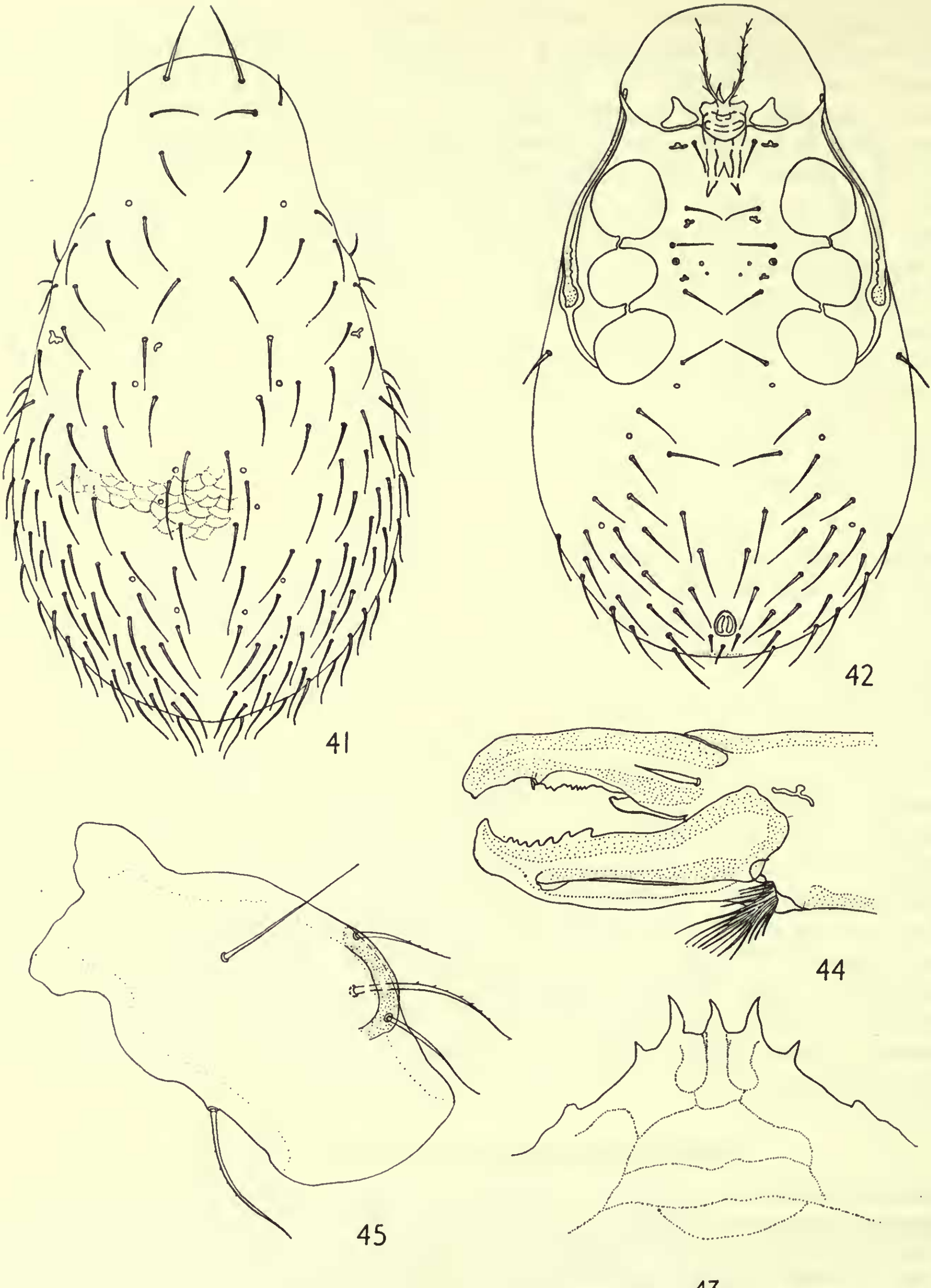
Pergamasus (Pergamasus) longicornis Berlese

Gamasus (*Pergamasus*) *crassipes* var. *longicornis* Berlese, A. (1906). *Redia* **3** : 232, fig.

Gamasus (*Pergamasus*) *crassipes* (L.) Latr. Berlese, A. (1906). *Redia* **3** : 229, fig. (female only).

Pergamasus crassipes (L.) var. *longicornis* : Trägårdh, I. (1912), *Arch. Zool. Expér. gén.* **8** : 523, figs. ; Trägårdh, I. (1931). *The Natural History of Juan Fernandez and Easter Islands* **3** : 603, figs. ; Turk, F. A. (1945). *Ann. Mag. nat. Hist.* **12** 11 : 802, figs. ; Schweizer, J. (1961). *Denks. schweiz. naturf. Ges.* **84** : 59, figs.

Gamasus (*Pergamasus*) *crassipes* (L.) var. *longicornis* : Halbert, J. N. (1915). *Proc. R. Irish Acad.* **31** 39 ii : 54, fig.



Figs. 41–45. *Pergamasus* (*Pergamasus*) *longicornis* Berlese, male.
Fig. 41 dorsum of idiosoma. Fig. 42 venter. Fig. 43 tectum. Fig. 44 chelicera. Fig. 45 trochanter of leg IV.

Pergamasus crassipes (L.) Latr. var. *longicornis :* Womersley, H. (1942). *Trans. Roy. Soc. S. Aust.* **66** (2) : 146, figs. (male only).

Pergamasus crassipes longicornis : Cooreman, J. (1943). *Bull. Mus. nat. Bel.,* **19** 63 : 4, fig.

Amblygamasus septentrionalis belgicus Cooreman, J. (1943). *Bull. Mus. nat. Bel.,* **19** 63 : 4, figs.

MALE. The dorsal shield (1,275–1,284µ long × 714–747µ wide) is pear-shaped and strongly sclerotized. The opisthonotal shield is densely covered with setae (Text-fig. 41).

The tritosternum is provided with a pair of pilose laciniae. The genital lamina is anteriorly produced into a sharp median spine (Text-fig. 42). A pair of prae-endopodal shields is present. The stigma is situated between coxae III and IV ; the peritreme extends to coxa I. There is a post-stigmatal prolongation of the peritrematal shield which reaches to coxa IV. A pair of post-stigmatal setae is present.

The tectum has five prongs (Text-fig. 43). The most distinctive features of the pedipalp are : the trochanter without any tubercle, the femur with a comb-like seta and the genu with two spatulate setae. The chelicera is robust and shown in Text-fig. 44. The corniculus and hypostomal processes are similar to those in *P. crassipes*.

The tibia, tarsus and prae-tarsus of leg I are 250–266µ, 304–342µ and 25–35µ long respectively. Leg II : the femur is crassate with a strong falcate spur and the genu has a tubular spur ; the tibia has three spurs, namely distal, medial and lateral (Plate 1b). The median process terminates in a hook-like structure, and this shape is constant in all the specimens I have examined. The distinctive shape of the trochanter of leg IV is figured (Text-fig. 45).

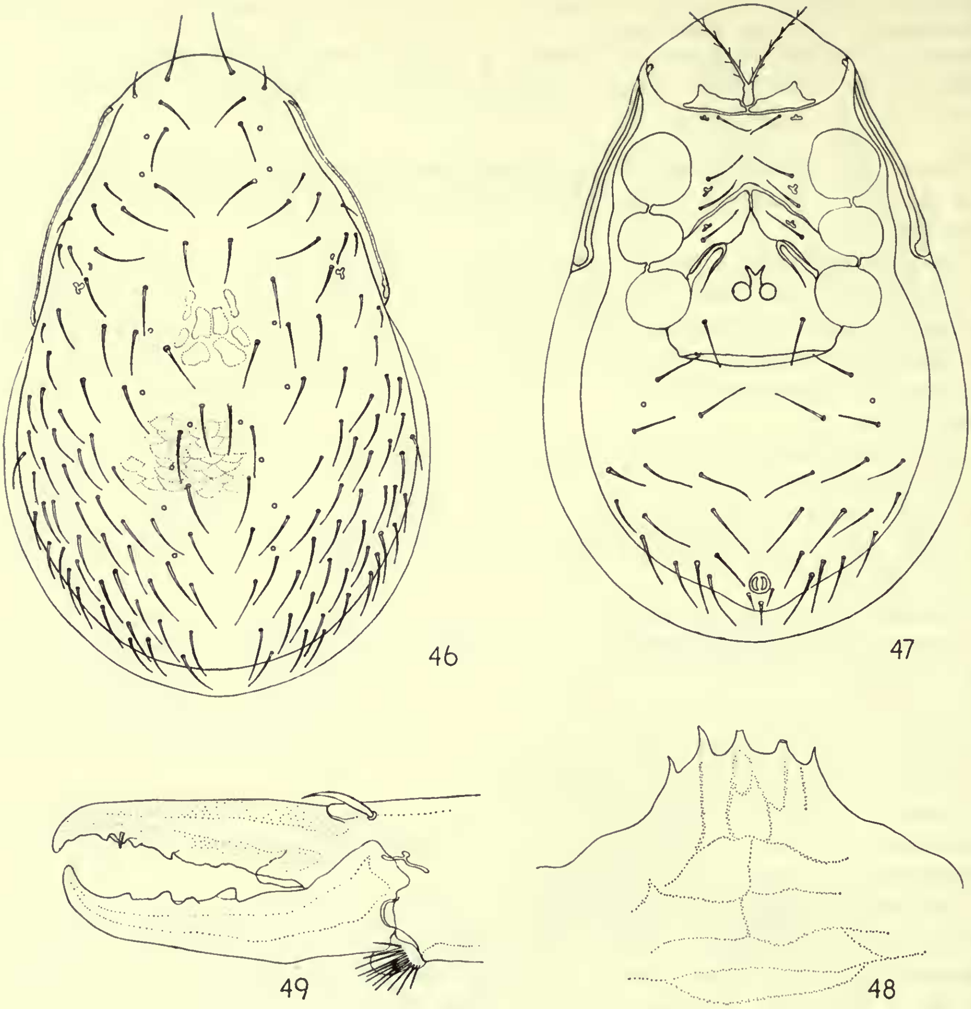
FEMALE. The dorsal shield measures 1,268–1,317µ long × 797–815µ wide and is dark brown to deep yellow in colour. The distribution and relative lengths of the dorsal setae are shown in Text-fig. 46.

The tritosternum and prae-endopodal shields are delineated as in Text-fig. 47. The metasternal shields are free. The endogynium has a pair of round sacs with a bifurcate median process. Each sac is strongly reticulated. The genital shield is shown in Plate 7b. The setation of the opisthogastral shield is shown in Text-fig. 47. The stigma is situated between coxae III and IV with the peritreme extending to coxa I. The peritrematal shield is entirely fused with the dorsal shield.

The tectum is five-pronged (Text-fig. 48). The pedipalp is essentially similar to that in the male. The chelicera is figured (Text-fig. 49).

Leg I has the tibia, tarsus and prae-tarsus 262–266µ, 358–363µ and 29–35µ long respectively. The trochanter of leg IV lacks a spur.

DISTRIBUTION AND HABITAT. This species has been recorded from Northern Europe (Berlese, 1906), Germany, Norway (Trägårdh, 1912), Ireland (Halbert, 1915), Juan Fernandez and Easter Islands (Trägårdh, 1931), Australia (Womersley, 1942) and Belgium (Cooreman, 1943). I have examined specimens from litter under *Cupressus* sp. (Rothamsted Lodge, Rothamsted Experimental Station, Harpenden, Hertfordshire, G. Owen Evans and E. Browning, 18.iii.1957). Oak and birch leaves



Figs. 46–49. *Pergamasus* (*Pergamasus*) *longicornis* Berlese, female. Fig. 46 dorsum of idiosoma. Fig. 47 venter. Fig. 48 tectum. Fig. 49 chelicera.

(Newton Abbot, S. Devon, R. G. Lewesther, 21.vi.1951). Litter and humus under pines and holly (Duddleswell, Ashdown Forest, Sussex, K. H. Hyatt, 10.ix.1956). Moss leaves (Adelaide Hill, Bowness, Cumberland, J. T. Salmon, 29.vi.1951). Summit of Dove Crag, 2,600 ft. (near Ambleside, Westmorland, M. E. Bacchus, 28.ii.1954). *Sphagnum*, etc. (Cock Hill, Yorkshire, J. T. Salmon, 21.vii.1951). In leaf mould (Epping Forest, Essex, J. T. Salmon, 27.v.1951). In leaf mould (Savernake Forest, Berkshire, J. T. Salmon, 26.ix.1951). In moss of wall (Tarn Hows, N. Lancashire, M. E. Bacchus, 4.xii.1954). Litter under thick evergreen hedge (St. Agnes, Isles of Scilly, Cornwall, K. H. Hyatt, 29.iii.1957). Litter and soil under evergreen trees (St. Agnes, Isles of Scilly, Cornwall, K. H. Hyatt, 5.iv.1957). (Royal Botanical Gardens, Kew, Surrey, J. L. Gilbert, 5.iii.1961). Moss from crevices in rocks (near Force Forge, Westmorland, M. E. Bacchus, 2.xii.1954). In oak and beech leaf mould (Grasmere, Westmorland, J. T. Salmon, 26.vi.1951). Moles' (*Talpa europaea*) nest, near pasture (Godstow, Berkshire, Prof. P. A. Larkin, 4.ii.1962). Rotten black leaves at riverside rocks (on the river Brathy, S.W. Ambleside, Lancashire, P. N. Lawrence, 23.ix.1956).

From pine litter (Clyne Park, Swansea, S. K. Bhattacharyya, 4.i.1961). Salt marsh debris, (Llanrhidian, Glamorgan, P. N. Lawrence, 27.iii.1962). Yew and rhododendron humus (Educational Garden, Swansea University, Swansea, P. N. Lawrence, 26.iii.1962).

In moss (Tarbert, Crianlarich, Loch Lomond, Dunbarton, J. T. Salmon, 3.vii.1951). In moss and heather (Glen Garry, Perth, J. T. Salmon, 5.vii.1951). In dead leaves (Loch Lomond, between Glasgow and Tarbert, J. T. Salmon, 8.vii.1951).

Moss on rock (Caherbannagh, Co. Clare, Ireland, Nottingham University Expedition, viii.1961).

Pergamasus (Pergamasus) septentrionalis (Oudemans)

Parasitus septentrionalis Oudemans, A. C. (1902). *Tijdschr. Ent.* **45** : 39, figs.

Gamasus (*Amblygamasus*) *septentrionalis :* Berlese, A. (1906). *Redia* **3** : 188, figs.

Gamasus (*Amblygamasus*) *septentrionalis* var. *norvegicus* Berlese, A. (1906). *Redia* **3** : 190, figs. ; Sellnick, M. (1940). *Göteborgs VetenskSamh. Handl.* (5) **68** 14 : 58, figs.

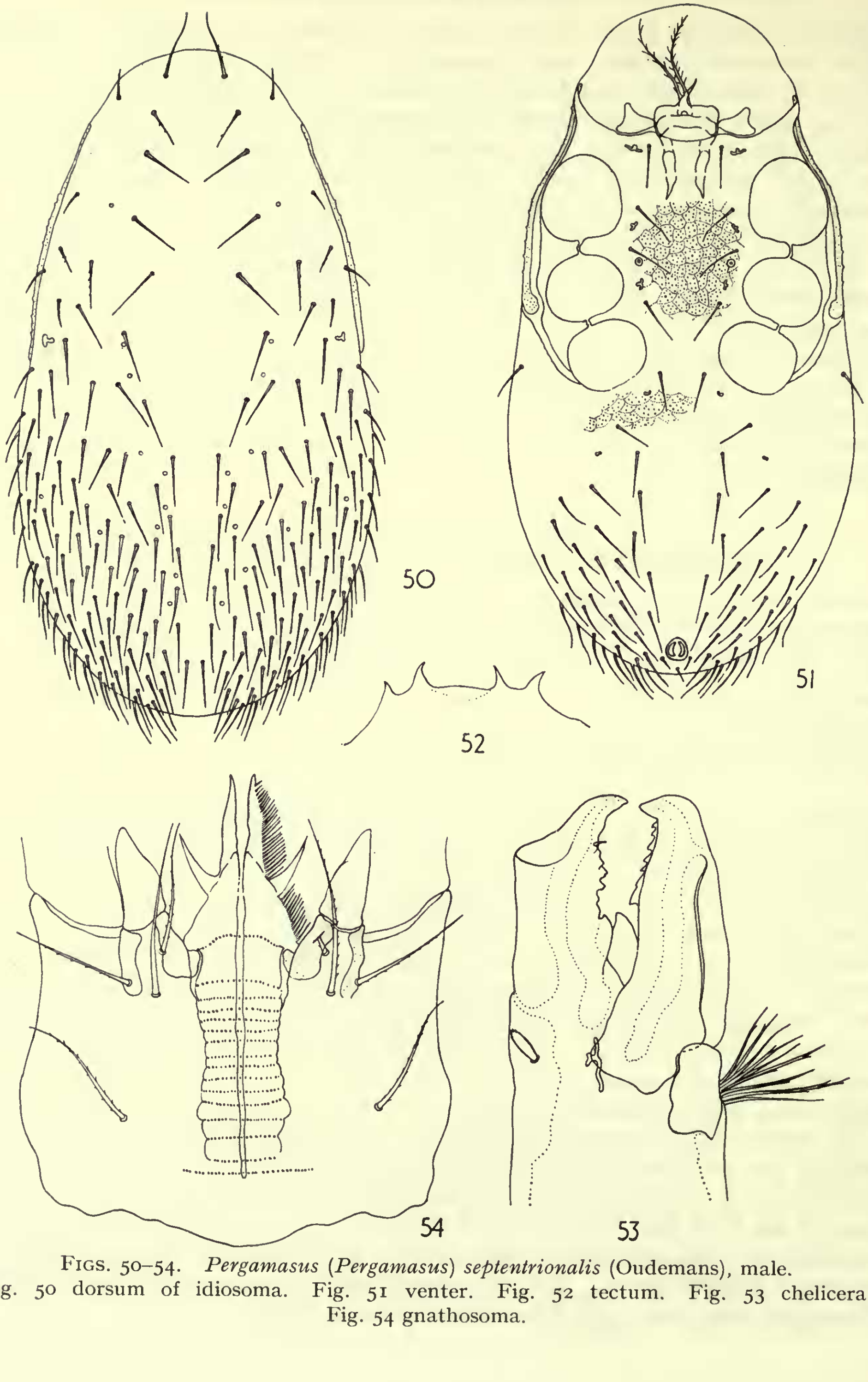
Amblygamasus septentrionalis (Oudemans) 1902. Haarlov, N. (1957). *Spolia zool. Mus. Hauniensis* **17** : 16, figs.

Amblygamasus septentrionalis (Oudemans) *norvegicus* Berlese 1905. Halašková, V. (1959). *Zvlástni. Otisk Mus. Zprávy Pražského Kraje* **4** : 6, figs.

MALE. This species is strongly sclerotized and reddish-brown in colour. The dorsal shield (1,383–1,463μ long × 714–721μ wide) is regionally reticulated. Only the opisthonotal shield is densely covered with setae (Text-fig. 50). Some dorsal shield setae appear to be pilose under high magnification.

The tritosternum has a pair of pilose laciniae. The genital lamina is produced, anteriorly, into a well developed sharp, median spine (Text-fig. 51). There is a pair of prae-endopodal shields. The sternal setae are sparsely pilose under high magnification. The pitted reticulation extends from the anterior margin of the sternal shield to a little behind coxae IV. The stigma is situated between coxae III and IV ; and the peritreme extends as far as coxa I. The post-stigmatal extension of the peritrematal shield extends to coxa IV.

The tectum is four-pronged (Text-fig. 52). The most distinctive features of the pedipalp are : the femur with one and the genu with two distally denticulated setae. The chelicera is robust and its digit has a row of closely-set teeth. The distinctive shape of the fixed digit is shown in Text-fig. 53 ; the dorsal seta being terminally denticulated. The corniculus is distinctively stalked and the hypostomal processes are shown in Text-fig. 54. The deutosternal denticles are arranged in fourteen or fifteen transverse rows. The hypostomal setae are pilose.



Figs. 50–54. *Pergamasus* (*Pergamasus*) *septentrionalis* (Oudemans), male. Fig. 50 dorsum of idiosoma. Fig. 51 venter. Fig. 52 tectum. Fig. 53 chelicera. Fig. 54 gnathosoma.

The tarsus (462–475μ) of leg I is considerably longer than the tibia (337–358μ) ; the prae-tarsus is 41–49μ long. Leg II ; the femur is without a distinct spur, the genu has three processes and two of them are well developed and retrogade (Plate 1c). The main tibial process is large, conical and stalked. The trochanter of leg IV is simple.

FEMALE. The dorsal shield (1,400–1,567μ long × 847–950μ wide) is strongly sclerotized and tapers anteriorly. The neotrichy is confined to the posterior half of the dorsal shield (Text-fig. 55). A few dorsal setae appear pilose under high magnification.

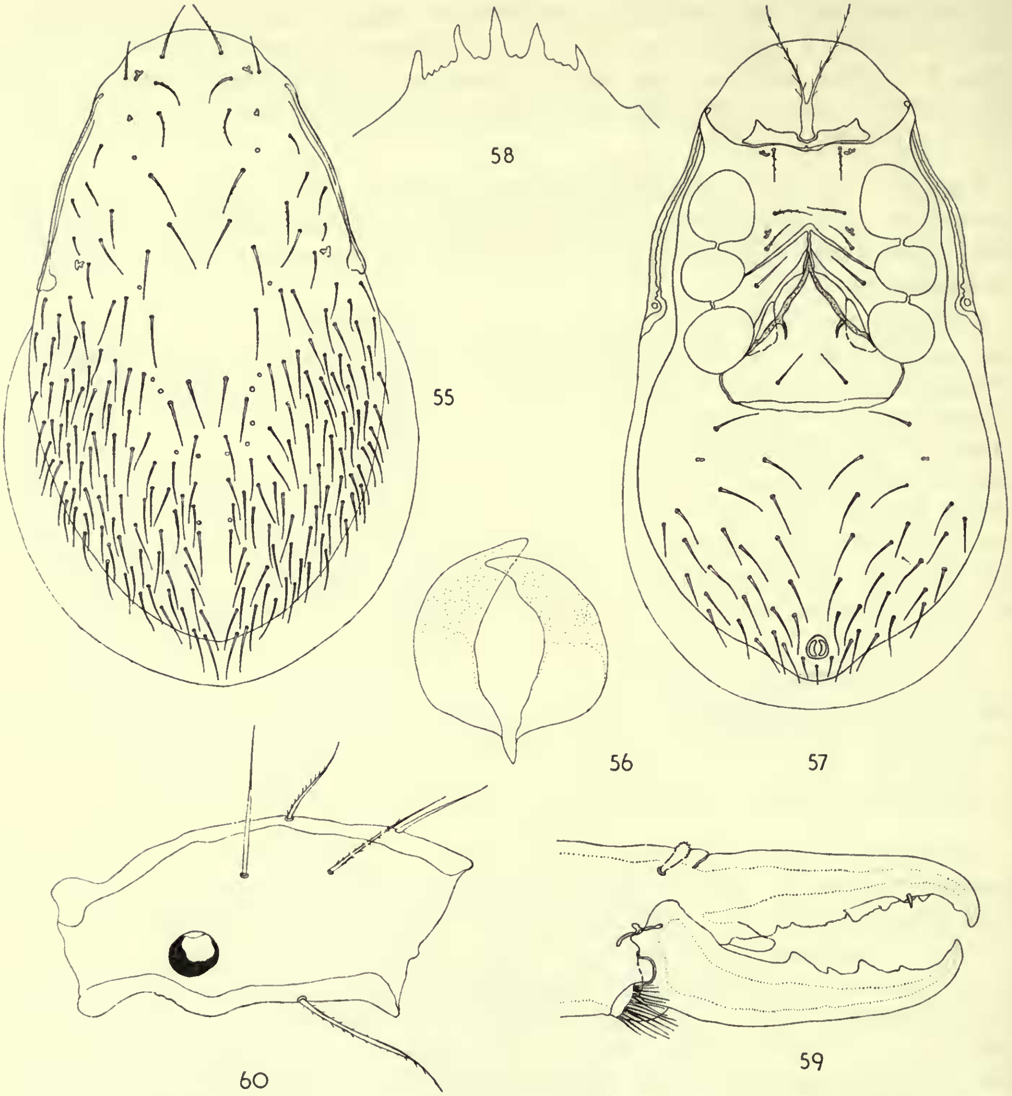
Ventrally, there are two large prae-endopodal shields almost meeting in the median line and forming a cup-shaped structure into which the base of the tritosternum is situated. The sternal setae I–III are pilose. The metasternal shields are free. The endogynium has a pair of blunt horn-like lobes joined together by a common stalk (Text-fig. 56). The genital shield is shown in Plate 7c. A very short median process may be present between the sacs. The pitted reticulation of the ventral shield extends from the anterior margin of the sternal shield to a little behind coxae IV. The distribution of setae on the opisthogastral shield is shown in Text-fig. 57. The peritrematal shield is entirely fused with the dorsal shield. The stigma is situated between coxae III and IV ; the peritreme extends to the level of coxa I.

The tectum is shown in Text-fig. 58. The pedipalp is similar to that in the male. The dentition of the chelicera and the form of the spermadactyl process are shown in Text-fig. 59. The dorsal seta of the fixed digit is terminally denticulated.

The tarsus (477–508μ) of leg I is much longer than the tibia (367–400μ) ; the prae-tarsus is 37–49μ long. The trochanter of leg IV is shown in Text-fig. 60.

DISTRIBUTION AND HABITAT. This species has already been recorded from Holland (Oudemans, 1902), Germany and Norway (Berlese, 1906), Iceland (Sellnick, 1940), Denmark (Haarlov, 1957) and Czechoslovakia (Halašková, 1959).

I have examined specimens from : leaf mould (Savernake Forest, Berkshire, J. T. Salmon, 26.ix.1951). Litter under thick evergreen hedge (St. Agnes, Isles of Scilly, Cornwall, K. H. Hyatt, 29.iii.1957). Rotten black leaves at riverside rocks (on the river Brathy, S.W. Ambleside, Lancashire, P. N. Lawrence, 23.ix.1956). Leaf mould from woods (near Buxton, Derbyshire, J. T. Salmon, 23.vi.1951). Rotten reeds (Colletts Bridge, nr. Wisbech, Cambridge, P. N. Lawrence). Ash humus (Colletts Bridge, nr. Wisbech, Cambridge, P. N. Lawrence, 16.x.1960). Rotten wood (Blurridge Farm, Ridge Hill, Combe Martin, Devonshire, M. E. Bacchus, 12.iii.1957). In leaf mould (Richmond Park, Surrey, J. T. Salmon, 19.iii.1951). In leaf mould (Leith Hill, Surrey, J. T. Salmon, 16.vi.1951). Summit of Dove Crag (near Ambleside, Westmorland, M. E. Bacchus, 29.ii.1954). Stratton Strawless, near Aylsham, Norwich, Norfolk, J. T. Salmon). Yew and rhododendron (Educational Garden, Swansea University, Swansea, P. N. Lawrence, 26.iii.1962). Bracken litter (Bishopston Common, Swansea, S. K. Bhattacharyya, 4.i.1961). In moss and heather (Glen Garry, Meall Doire an Daimh 1900 ft., Perth, J. T. Salmon, 5.vii.1951



FIGS. 55–60. *Pergamasus* (*Pergamasus*) *septentrionalis* (Oudemans), female. Fig. 55 dorsum of idiosoma. Fig. 56 endogynial process. Fig. 57 venter. Fig. 58 tectum. Fig. 59 chelicera. Fig. 60 trochanter of leg IV.

In moss (Tarbert, Crianlarich, Loch Lomond, Dunbarton, J. T. Salmon, 3.vii.1951). Moss on rock under Hazel (Caherbannagh, Co. Clare, Ireland, Nottingham University Expedition, viii.1961).

BIOLOGICAL NOTES. Six females were kept in the laboratory and all of them laid eggs erratically. Ten eggs were laid by one female and the oviposition period extended for thirty-one days. The eggs are relatively large in size and lustrous.

The outer surface of the chorion is densely covered with hair-like outgrowths. The eggs hatched in two to five days and the non-feeding larval stage lasted one to three days (average 2.44 days). The larva is sluggish. There are two feeding nymphal stages, the proto- and deutonymph. High mortality in the culture was observed for the protonymphs. The duration of the protonymphal stage was seven to twenty-two days (average 14.5 days). Two deutonymphs moulted into adult females and the duration of this stage was seven and twenty-one days, respectively. The nymphal and adult stages are very active and cannibalistic.

Pergamasus (Pergamasus) quisquiliarum (Can.)

Gamasus quisquiliarum Canestrini, G. & R. (1882). *Atti. Ist. Veneto*, **8** (5) : 920.
Gamasus (*Pergamasus*) *quisquiliarum* : Berlese, A. (1906). *Redia* **3** : 223, figs.
Pergamasus quisquiliarum : Cooreman, J. (1943). *Bull. Mus. roy. Hist. nat. Bel.* **19**, 63 : 7, fig. ; Halašková, V. (1959). *Zvlástni Otisk Mus. Zprávy Pražského Kraje* **4** : 3, figs. ; Schweizer, J. (1961). *Denks, schweiz. naturf. Ges.* **84** : 41, figs.

MALE. This species is deep yellow to reddish-brown in colour and well sclerotized. The dorsal shield (1,157–1,317μ long × 582–615μ wide) is without a transverse suture and is regionally reticulated. The opisthonotal shield is densely covered with setae, neotrichous (Text-fig. 61). Some dorsal setae appear to be pilose, under high magnification.

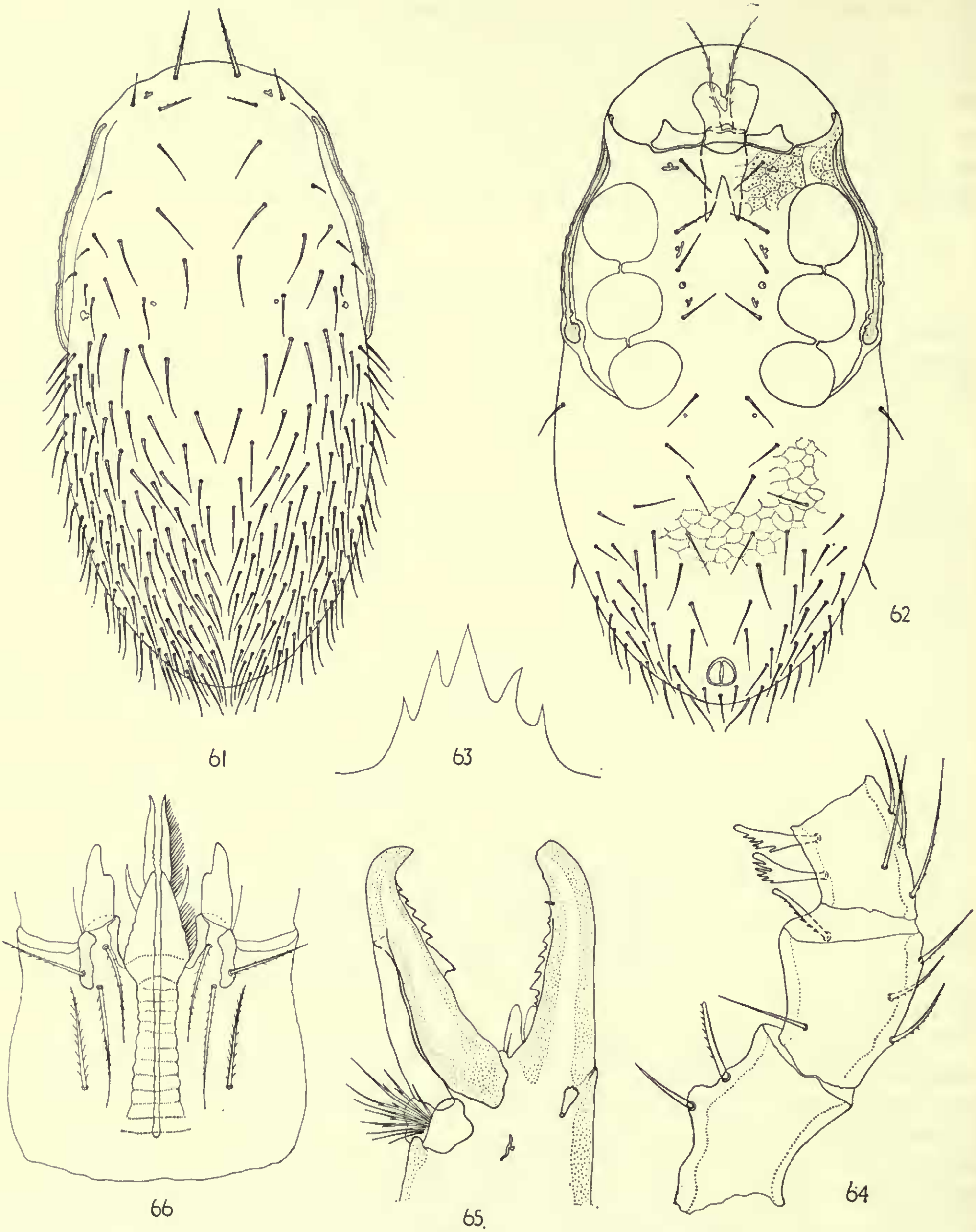
The tritosternum is well developed with a pair of pilose laciniae. The genital lamina has a median incision (Text-fig. 62). Two large prae-endopodal shields flank the genital sclerite. The pitted reticulation extends from the anterior margin of the sternal shield to a little behind coxae IV. The stigma is situated between coxae III and IV ; the peritreme anteriorly extends to coxa I and its outer margin is crenate. Posteriorly, the post-stigmatal prolongation of the peritrematal shield extends to coxa IV.

The tectum has five prongs (Text-fig. 63). The distinctive features of the pedipalp are shown in Text-fig. 64. The fixed digit of the chelicera is multi-dentate and the teeth are confined to the distal half of the digit. The fixed digit is truncated and the dorsal seta has a denticulated end (Text-fig. 65). The anterior lateral margins of the hypostomal processes are fringed (Text-fig. 66). The corniculus is stalked and is of distinctive shape.

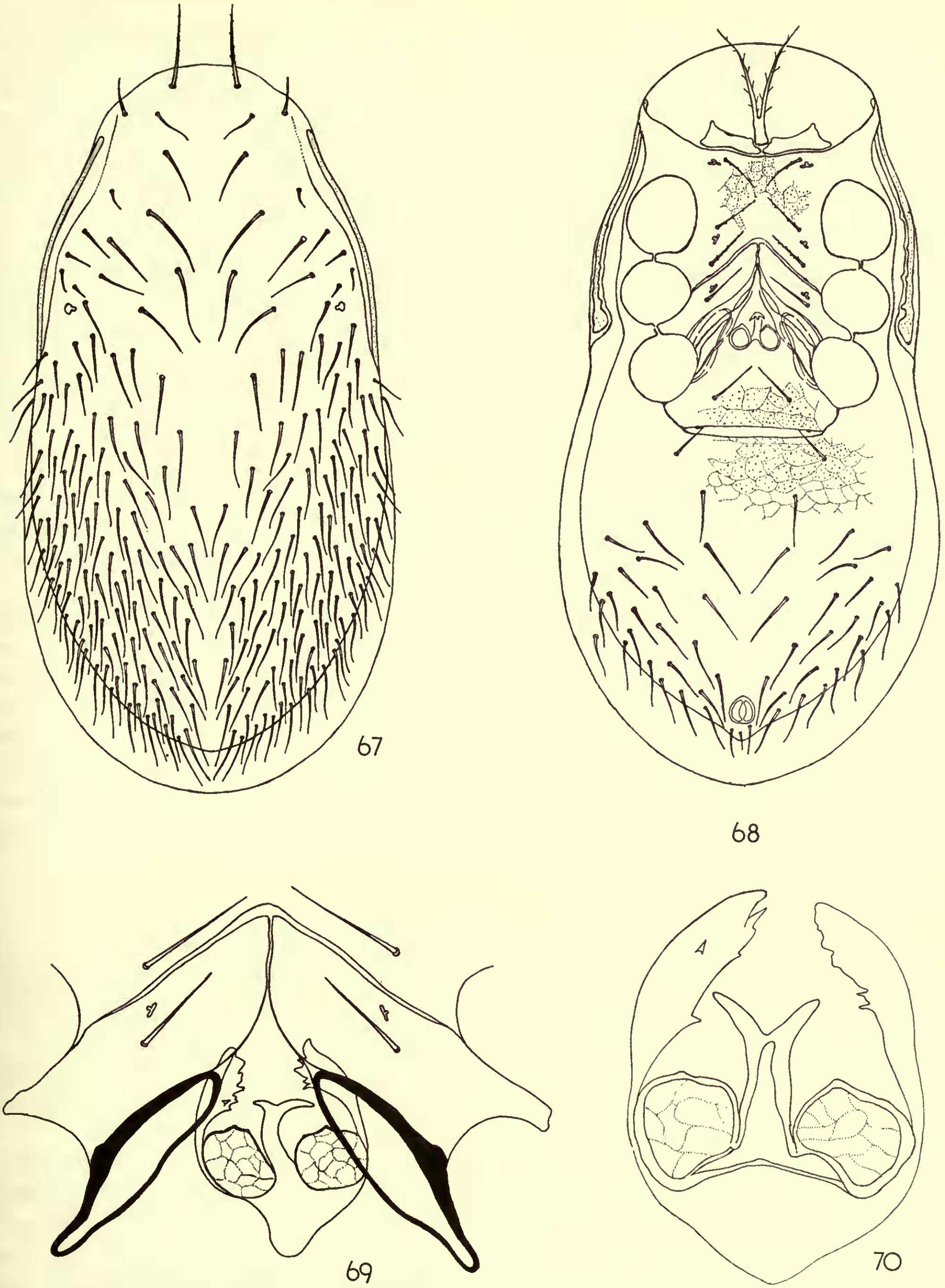
The tibia, tarsus and prae-tarsus of leg I are 254–312μ, 388–392μ and 45–49μ long, respectively. Leg II : the femur lacks an accessory spur and the main spur is distally truncated. The genual process is very weakly developed (Plates 1d & e). The tibia is provided with a vermiform process. The trochanter of leg IV is without any process.

FEMALE. The dorsal shield (1,317–1,417μ long × 764–815μ wide) is regionally reticulated. The podonotal shield is non-neotrichous, whilst the opisthonotal shield is densely covered with setae (Text-fig. 67).

The tritosternum has a pair of pilose laciniae. The tritosternal base is situated in a cup-like structure formed by a pair of prae-endopodal shields. The ventral shield



FIGS. 61–66. *Pergamasus* (*Pergamasus*) *quisquiliarum* (Canestrini), male. Fig. 61 dorsum of idiosoma. Fig. 62 venter. Fig. 63 tectum. Fig. 64 trochanter, femur and genu of pedipalp. Fig. 65 chelicera. Fig. 66 venter of gnathosoma.



FIGS. 67–70. *Pergamasus* (*Pergamasus*) *quisquiliarum* (Canestrini), female. Fig. 67 dorsum of idiosoma. Fig. 68 venter. Fig. 69 genital region without epigynial shield. Fig. 70 bifurcated endogynial process.

is regionally ornamented with a pitted reticulation (Text-fig. 68). The metasternal shields are free and flank the epigynial shield. The genital shield is shown in Plate 7d. The endogynial process is complicated and its sacs are somewhat rounded in shape (Text-fig. 69). There is a median, elongated process in between the endogynial sacs, the terminal end of which may be bi- or trifurcated (Text-figs. 70 and 71). The stigma is situated between coxae III and IV ; the peritreme extends to coxa I. The entire peritrematal shield is fused with the dorsal shield.

The tectum and dentition of the chelicera are shown in Text-figs. 72 and 73 respectively. The pedipalp is essentially similar to that of the male (Text-fig. 74). Approximately half of the lateral margins of the hypostomal processes are fringed (Text-fig. 75). The deutosternal denticles are arranged in fourteen to sixteen transverse rows.

The tarsus (470–487μ long) of leg I is considerably longer than the tibia (350–367μ) ; the prae-tarsus is 29–55μ long. The trochanter of leg IV is without a tubercle.

DISTRIBUTION AND HABITAT. This species has previously been recorded from Italy (Canestrini & Canestrini, 1882), Norway (Berlese, 1906), Belgium (Cooreman, 1943), Czechoslovakia (Halašková, 1959), Switzerland (Schweizer, 1961) and South America (Sheals, 1962).

I have examined specimens from the following localities : Litter and soil under evergreen trees (St. Agnes, Isles of Scilly, Cornwall, K. H. Hyatt, 5.iv.1957). In leaf mould (Houghton Green, Rye, Sussex, J. T. Salmon, 19.v.1951). Bramble-covered ditch (Colletts Bridge, Norfolk, P. N. Lawrence). From soil (between Rockingham and Corby, Northants, B. N. K. Davies, 14.i.1958). Rotten reeds (Colletts Bridge, Norfolk, P. N. Lawrence). Litter under *Cupressus* sp. (Rothamsted Lodge, Rothamsted Experimental Station, Harpenden, Hertfordshire, G. Owen Evans and E. Browning, 18.iii.1957). Oak and beech litter (Singleton Park, Swansea, S. K. Bhattacharyya, 3.i.1961).

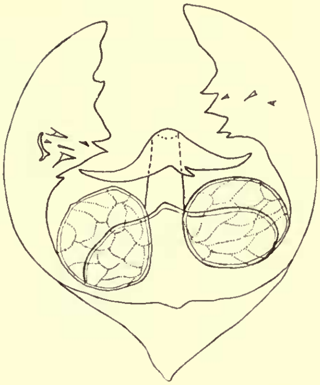
Pergamasus (Pergamasus) mirabilis Willmann

Pergamasus mirabilis Willmann, C. (1951). *SitzBer. Österr. Akad. Wiss.* Abt. 1, **160** : 99, figs.

Amblygamasus mirabilis : Schweizer, J. (1961). *Denks. schweiz. naturf. Ges.* **84** : 66, figs.

MALE. The dorsal shield (771–838μ long × 400–424μ wide) is reddish in colour and has a transverse suture (Text-fig. 76). Some dorsal setae appear to be pilose under high magnification.

The form of the prae-endopodal shields is shown in Text-fig. 77. The tritosternum has a pair of pilose laciniae but the tritosternal base is completely hidden by the genital lamina. The setation of the opisthogastral shield is figured. The pitted reticulation extends from the anterior margin of the sternal shield to a little behind the coxa of leg IV. The stigma is situated between coxae III and IV ; and the undulating peritreme reaches to coxa I. A pair of post-stigmatal setae is present.



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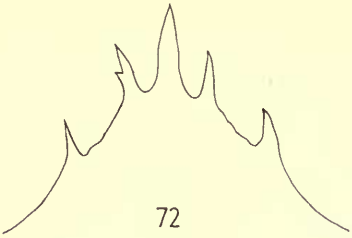

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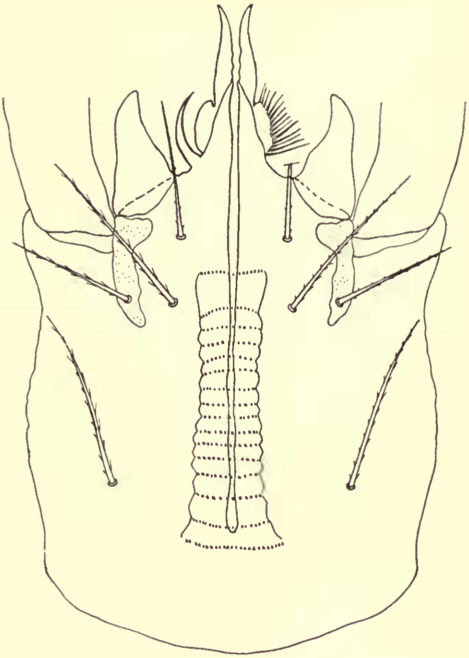

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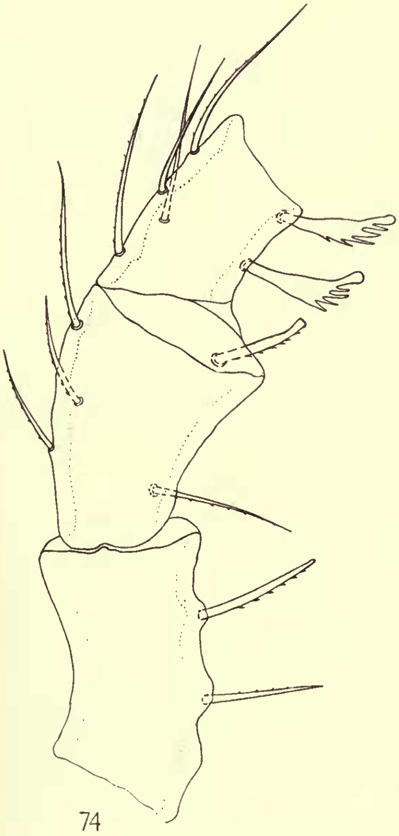

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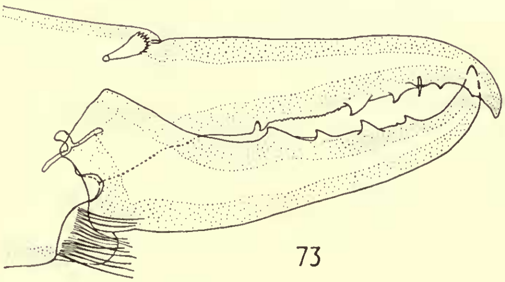

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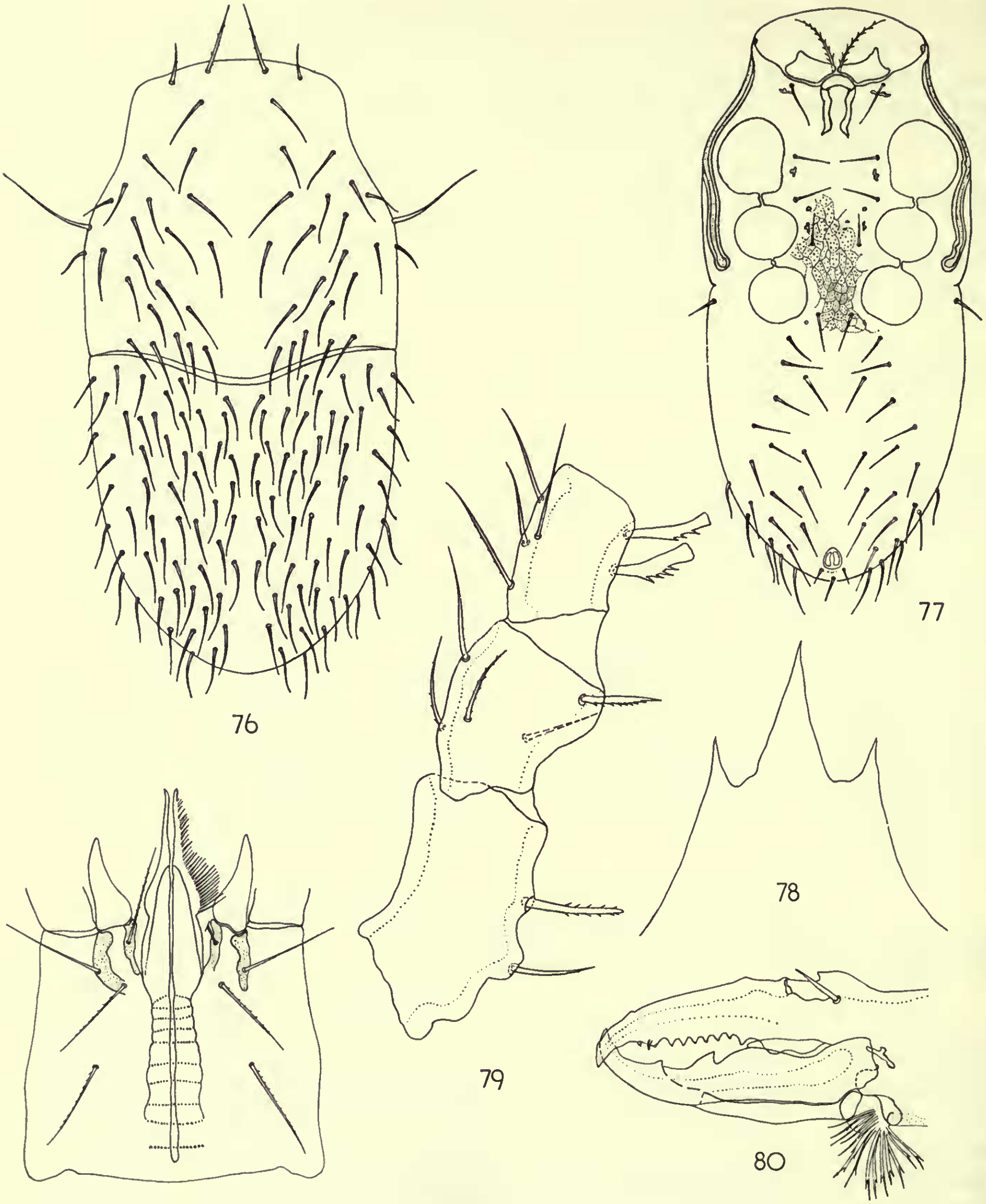
FIGS. 71–75. *Pergamasus* (*Pergamasus*) *quisquiliarum* (Canestrini), female. Fig. 71 trifurcated endogynial process. Fig. 72 tectum. Fig. 73 chelicera. Fig. 74 trochanter, femur and genu of pedipalp. Fig. 75 venter of gnathosoma.



FIGS. 76–81. *Pergamasus* (*Pergamasus*) *mirabilis* Willmann, male.
Fig. 76 dorsum of idiosoma. Fig. 77 venter. Fig. 78 tectum. Fig. 79 trochanter, femur and genu of pedipalp. Fig. 80 chelicera. Fig. 81 venter of gnathosoma.

The tectum is three-pronged, the median being longer and broader than the lateral tines (Text-fig. 78). The palpal trochanter, femur and genu are shown in Text-fig. 79. The chelicera is rather elongated with well developed dentition, (Text-fig. 80). A cone-shaped projection is especially discernible above the dorsal seta of the chelicera. The fixed digit is not truncated and has a simple dorsal seta. The teeth of the movable digit are well separated and the spermadactyl is normal. The corniculus is stalked ; and more than the distal half of the hypostomal processes is provided with fringes. The deutosternal denticles in the ventral groove of the gnathosoma are shown in Text-fig. 81.

The tibia (162–168μ) of leg I is remarkably shorter than the tarsus (221–247μ) ; the prae-tarsus is only 17–25μ long. The coxa of leg II has well-developed spurs (Plate 2a). The femur of leg II is not crassate (Plate 2b). The genu has a large falcate spur, and the tibia is devoid of processes. The trochanter of leg IV possesses no spur.

FEMALE. Unknown.

DISTRIBUTION AND HABITAT. This species is previously recorded from Austria (Willmann, 1951) and Switzerland (Schweizer, 1961).

I have examined specimens from soil (between Rockingham and Corby, Northants, B. N. K. Davis, 14.i.1958).

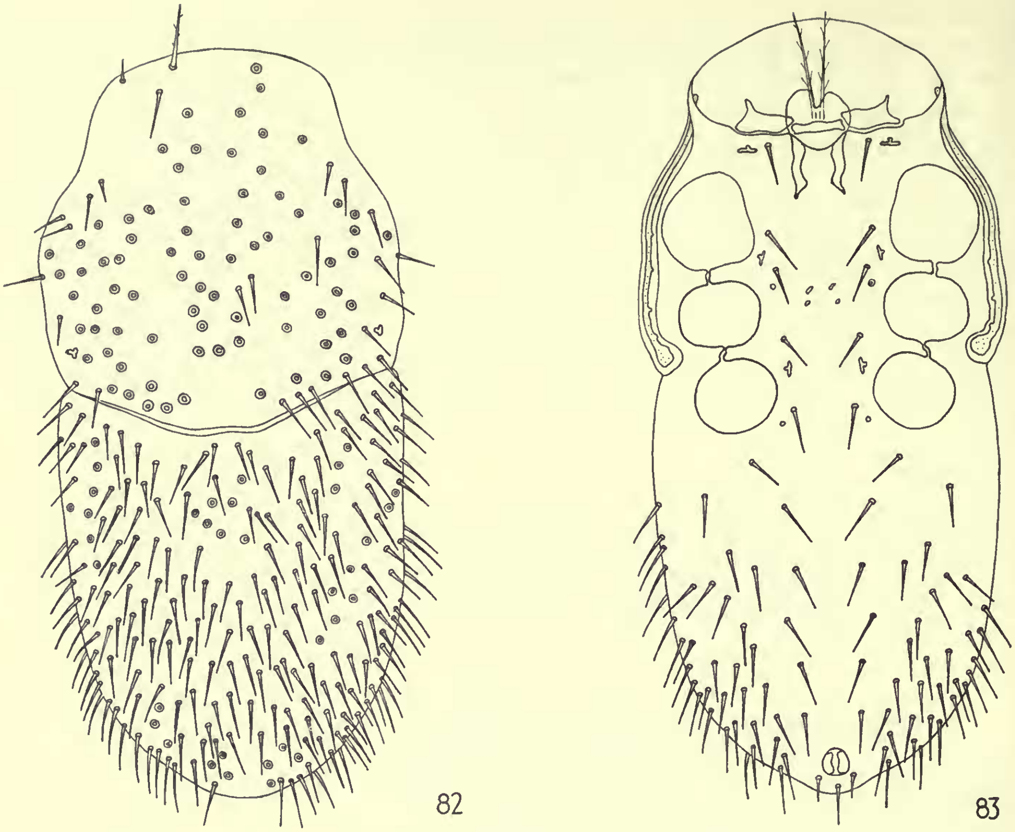
Pergamasus (Pergamasus) hamatus (C. L. Koch) Berlese, 1906

Gamasus hamatus Koch, C. L. (1839). *Deutsch. Crust. Myr. Arachn.* fasc. 26 t. 2.
Gamasus (*Pergamasus*) *hamatus* : Berlese, A. (1906). *Redia* **3** : 212, figs.
Gamasus (*Pergamasus*) *hamatus* var. *gracilis* Berl. (sic) : Berlese, A. (1906). *Redia* **3** : tab. V, fig. Tab. XIV, figs.
Pergamasus hamatus : Schweizer, J. (1961). *Denks. schweiz. naturf. Ges.* **84** : 61, figs.
Pergamasus hamatus (Koch) var. *longipes* Schweizer, J. (1961). *Denks. schweiz. naturf. Ges.* **84** : 62, figs.

MALE. The dorsal shield (1,157μ long × 582μ wide) is strongly sclerotized and provided with a median transverse suture. This species differs from other neotrichous species in that the neotrichy extends into the podonotal region of the dorsal shield (Text-fig. 82). Some dorsal setae appear pilose under high magnification.

Ventrally, the tritosternum has a pair of well-developed pilose laciniae but the tritosternal base is completely hidden by the genital lamina. The distribution of the prae-endopodal shields, and the shape of the genital lamina, is shown in Text-fig. 83. The setation of the opisthogastral shield is figured. The stigma is situated between coxae III and IV ; the peritreme extends to coxa I. The peritrematal shield lies along the dorso-ventral margin of the body.

The tectum is three-pronged, the median prong being longer than the lateral ones (Text-fig. 84). The dorsal surface of the tectum is faintly reticulated. The pedipalp trochanter is tuberculated (Text-fig. 85) ; the femur and genu are provided with one comb-like and two palmate setae, respectively. The fixed digit of the chelicera has

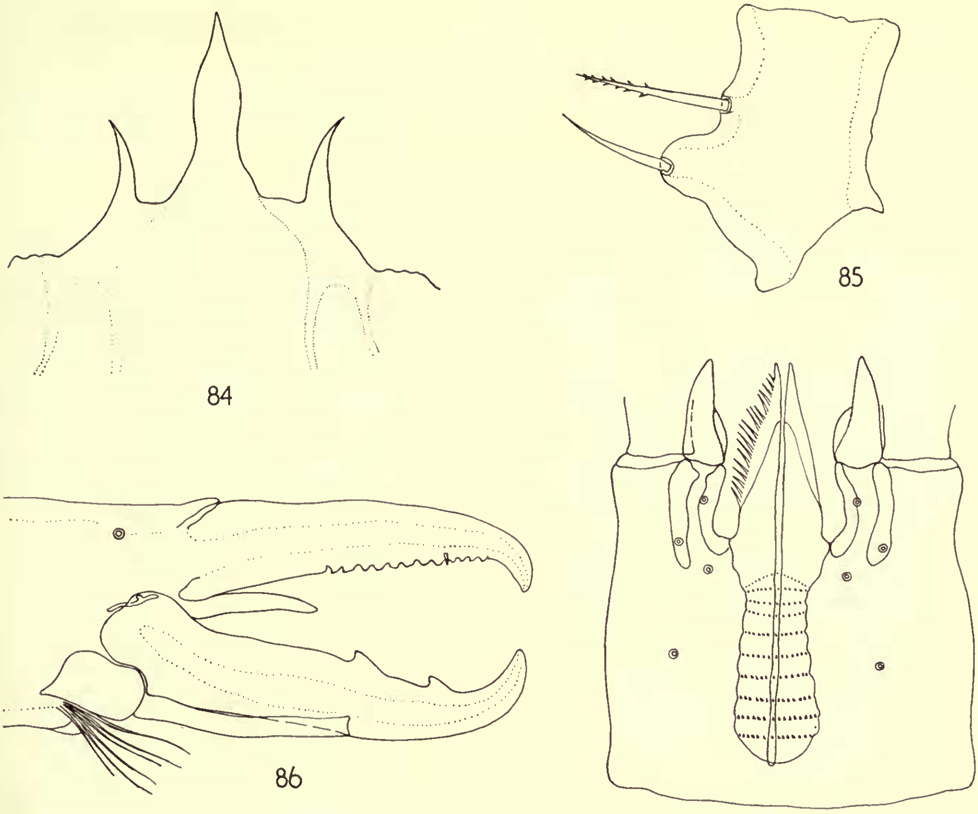


Figs. 82–83. *Pergamasus* (*Pergamasus*) *hamatus* (Koch), male.
Fig. 82 dorsum of idiosoma. Fig. 83 venter.

a row of closely-set teeth ; the movable digit is bidentate with a normal spermadactyl (Text-fig. 86). The terminal ends of both digits are pointed and the arthrodial membranes are simple and branched. The corniculus has a distinct stalk and its peculiar shape is shown in Text-fig. 87. The fringed hypostomal processes are as figured. The deutosternal denticles on the ventral groove of the gnathosoma are arranged in ten transverse rows.

The tibia, tarsus and prae-tarsus of leg I are 254μ, 333–337μ and 41μ long respectively. The distinctive feature of leg II is shown in Plate 2c. The femur has a relatively small main falcate spur at the base of which is an elongated accessory spur. The genu and tibia are armed with conical rather than elongate spurs. The trochanter of leg IV is without any prominence.

Female. The dorsal shield (1,200–1,268μ long × 665μ wide) tapers posteriorly. The setation of the dorsal shield is similar to that of the male (Text-fig. 88).

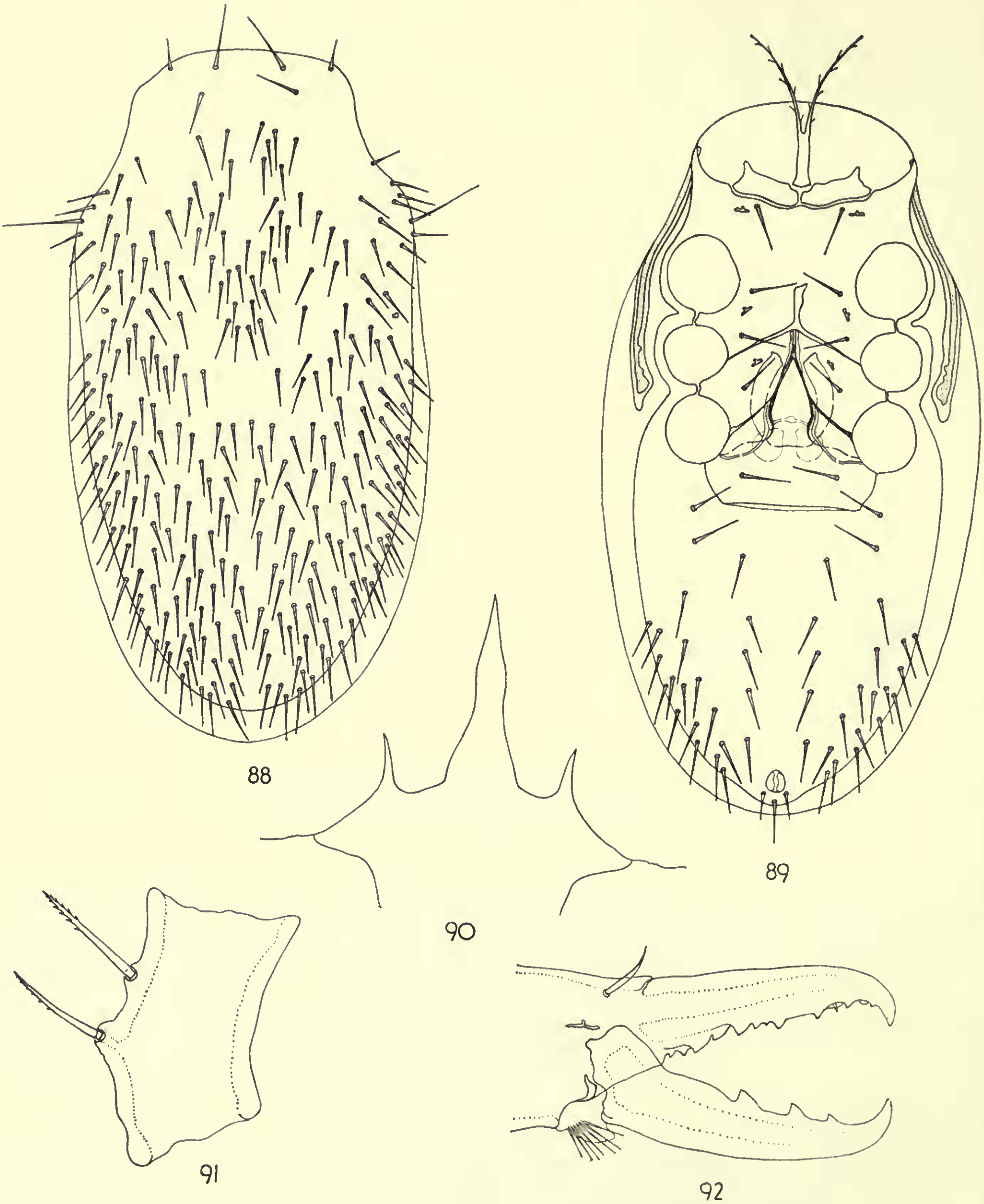


Figs. 84–87. *Pergamasus* (*Pergamasus*) *hamatus* (Koch), male.
Fig. 84 tectum. Fig. 85 trochanter of pedipalp. Fig. 86 chelicera. Fig. 87 venter of gnathosoma.

The tritosternum is well developed with an elongated basal part and a pair of pilose laciniae. A pair of large prae-endopodal shields is present. The sternal shield is furnished with a median vertical groove which anteriorly reaches to about the level of sternal setae II. The metasternal shields may be fused. The endogynium has a pair of horns. The endogynial processes are relatively simple. The setation of the opisthogastral shield is shown in Text-fig. 89. The stigma is situated between coxae III and IV ; the peritreme extends to coxa I. The antero-lateral margin of the peritrematal shield is coalesced with the dorsal shield at the level of coxa II, but the shield is free posteriorly.

The tectum is three-pronged (Text-fig. 90). The pedipalp is essentially similar to that in the male (except the trochanter, which lacks a tubercle, Text-fig. 91). The fixed digit is furnished with a row of closely-set teeth : the movable finger is tridentate, the teeth being well separated (Text-fig. 92).

Leg I with the tibia, tarsus and prae-tarsus 270μ, 350–367μ and 37μ long, respectively.



FIGS. 88–92. *Pergamasus* (*Pergamasus*) *hamatus* (Koch), female.
Fig. 88 dorsum of idiosoma. Fig. 89 venter. Fig. 90 tectum. Fig. 91 trochanter of pedipalp. Fig. 92 chelicera.

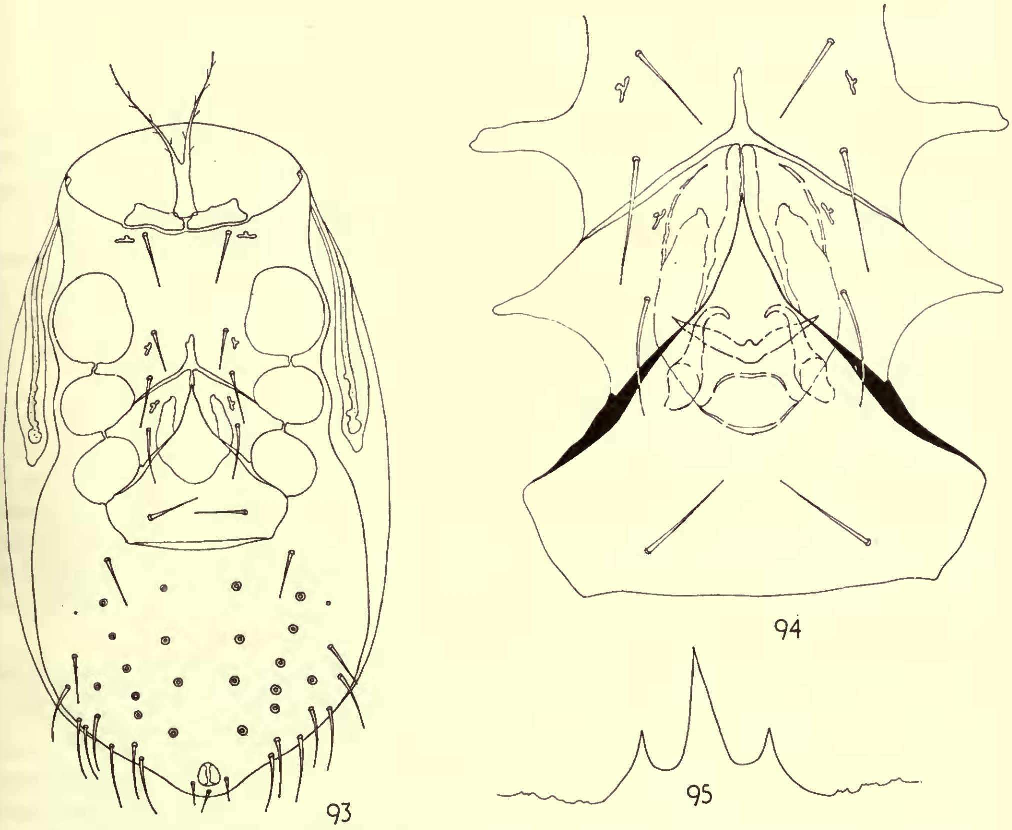
Distribution and habitat. This species has been recorded from Germany (Koch, 1839), Italy (Berlese, 1906) and Switzerland (Schweizer, 1961).

I have examined specimens from Brigster, Lancashire, and bulk soil, Ayside, Westmorland (J. Satchell, xi.1953).

Pergamasus (Paragamasus) hortensis sp. nov.

Female. The dorsal shield, in the compressed specimen, measures about 1,200μ long and 683μ wide, and is lightly sclerotized and yellow in colour. The chaetotaxy of the opisthonotal region shows neotrichy (Text-fig. 93).

Ventrally, the tritosternum has an elongate basal part and a pair of pilose laciniae. A pair of large prae-endopodal shields is present. The posterior margin of the sternal shield is provided with a short, median vertical fissure. The metasternal shields are free. The endogynial horns and processes are delineated in Text-fig. 94. The setation of the opisthogastral shield is figured. The stigma is situated between



Figs. 93–95. *Pergamasus* (*Pergamasus*) *hortensis* sp. nov., female.
Fig. 93 venter. Fig. 94 magnified structure of the sterniti-genital region. Fig. 95 tectum.

coxae III and IV ; the peritreme extends to coxa I. The peritrematal shield is free posteriorly.

The tectum has three prongs (Text-fig. 95). The chelicerae of the unique specimen have not been examined. The most distinctive features of the pedipalp are, the femur with a comb-like seta and the genu with two spatulate setae. The hypostomal process is similar to that in *P.* (*P.*) *quisquiliarum.*

Leg I with tibia, tarsus and prae-tarsus 274–279µ, 354µ and 43–45µ long respectively. The trochanter of leg IV is without any tubercle.

MALE. Unknown.

HABITAT. I have examined a single damaged female from greenhouse soil, Marton, Blackpool, Lancashire, M. Cohen, 1934 (Holotype 1963.2.7.10).

Pergamasus (Paragamasus) robustus (Oudemans)

Parasitus longulus (C. L. Koch), var. *robustus* Oudemans, A. C. (1902). *Tijdschr. Ent.* **45** : 38, figs.
Parasitus robustus : Oudemans, A. C. (1905). *Abh. Nat. Ver. Bremen* **18** : 82.
Gamasus (*Pergamasus*) *robustus :* Berlese, A. (1906). *Redia* **3** : 219, figs.
Pergamasus robustus : Trägårdh, I. (1910). *Naturw. Untersuch. Sarekgeb.* **4** (4) : 404, figs.

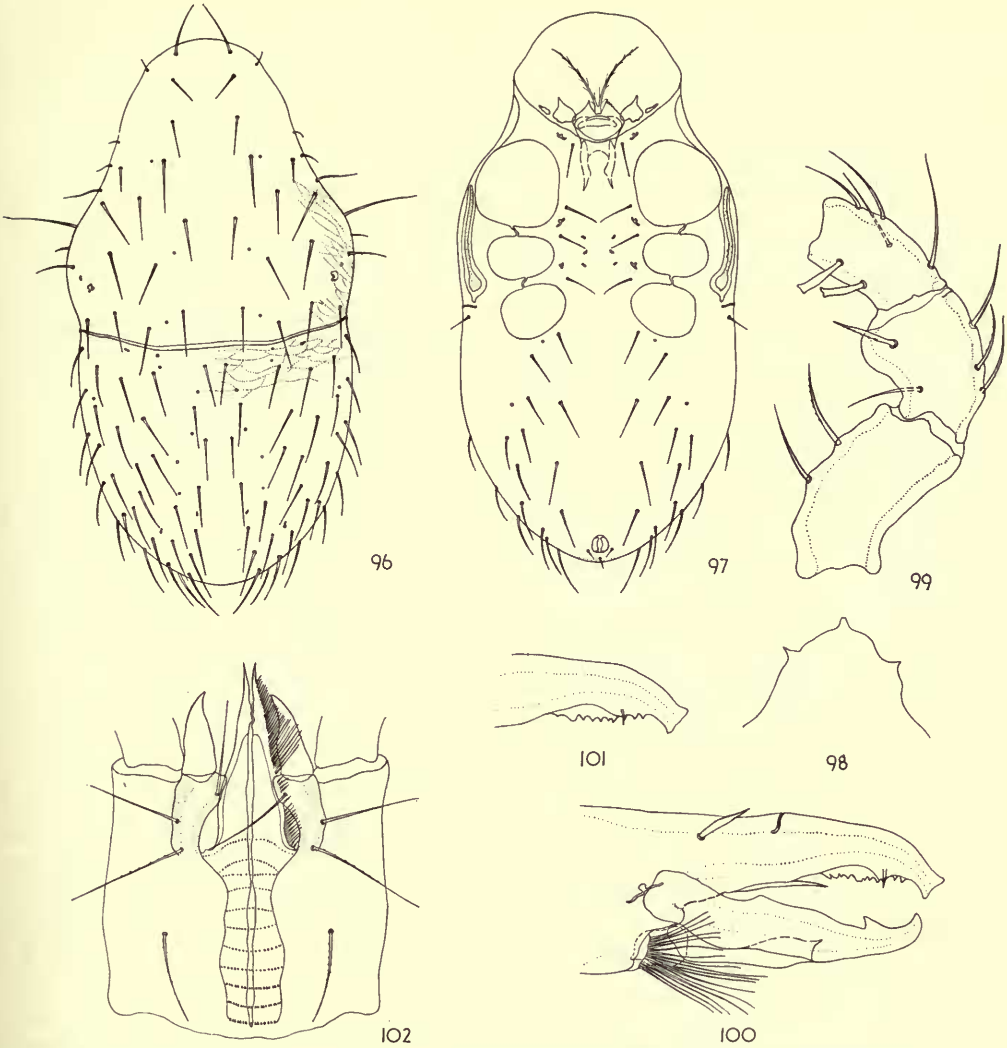
MALE. The dorsal shield (1,100–1,200µ long × 615–665µ wide) has a median transverse suture (Text-fig. 96). The podonotal region bears twenty-one pairs of setae and their distribution is figured. The opisthonotal region has a variable number of setae.

The tritosternum has a pair of well-developed ciliated laciniae. The genital lamina is distinctive in shape (Text-fig. 97). The anterior margin of the sternal shield is slightly concave. The setation of the opisthosomal region is figured. The stigma is situated between coxae III and IV ; the peritreme extends to coxa II. A pair of post-stigmatal setae is present.

The tectum is rounded in shape and provided with three prongs (Text-fig. 98). The most distinctive features of the chaetotaxy of the pedipalp are, the comb-like seta on the femur and the two spatulate setae on the genu. The palpal trochanter is without any tubercle (Text-fig. 99). The chelicera is robust, the fixed digit being truncated and with a variable number of teeth (Text-figs. 100 & 101). The movable digit is unidentate with a normal spermadactyl. There are ten transverse rows of deutosternal denticles. The entire outer margins of the hypostomal processes are fringed (Text-fig. 102). The corniculus is distinctly stalked.

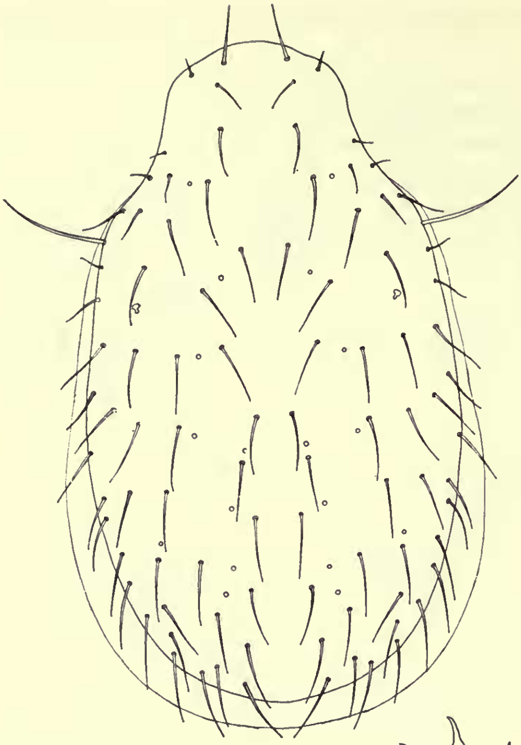
The tibia, tarsus and prae-tarsus of leg I are 183–188µ, 237–258µ and 17–25µ long respectively. The distinctive features of leg II are shown in Plate 2d and Plate 3f ; the trochanter being spurred. The trochanter of leg IV is devoid of processes.

FEMALE. The dorsal shield (1,117µ long × 598–632µ wide) is regionally reticulated. The anterior half of the dorsal shield is furnished with twenty-one pairs of setae, whilst the number of setae on the posterior half is greatly variable (Text-fig. 103).



FIGS. 96–102. *Pergamasus* (*Paragamasus*) *robustus* (Oudemans), male. Fig. 96 dorsum of idiosoma. Fig. 97 venter. Fig. 98 tectum. Fig. 99 trochanter, femur and genu of pedipalp. Fig. 100 chelicera. Fig. 101 variation in the dentition of the fixed digit. Fig. 102 venter of gnathosoma.

The tritosternum has a well-developed basal part. There is a granulated region in between a pair of large prae-endopodal shields. The sternal shield bears three pairs of setae and two pairs of pores. Posteriorly the sternal shield has a median narrow incision reaching the level of sternal setae II. The metasternal shields are free. A pair of endogynial horns is present. The endogynial processes are very complicated (Text-fig. 104). The genital shield is shown in Plate 7e. The stigma is situated between coxae III and IV ; the extension of the peritreme is as in the male.



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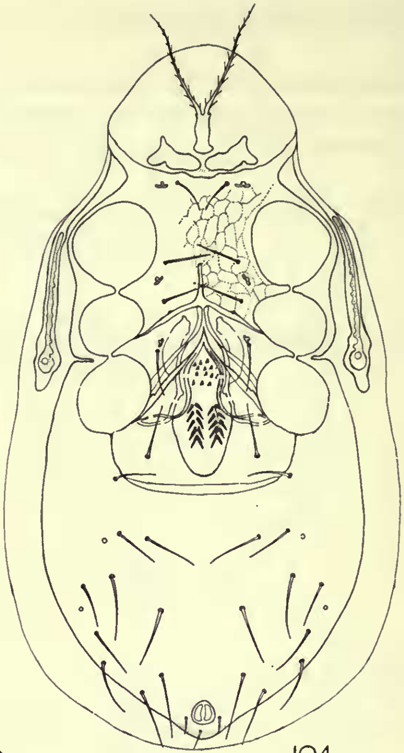

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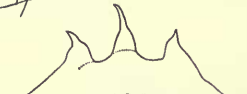

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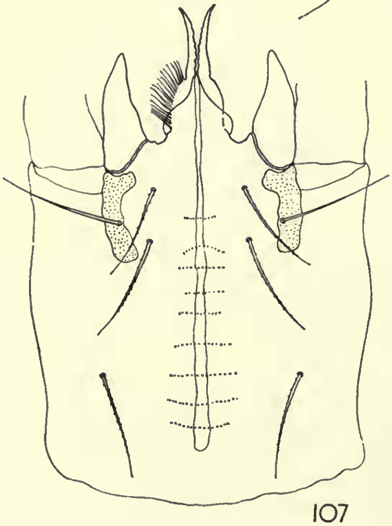

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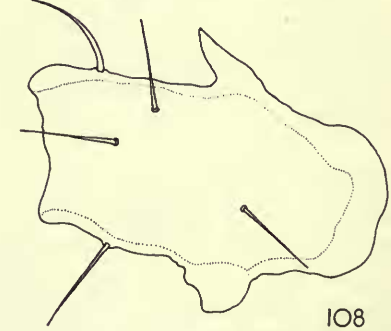

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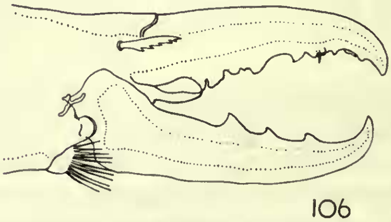

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FIGS. 103–108. *Pergamasus* (*Paragamasus*) *robustus* (Oudemans), female.
Fig. 103 dorsum of idiosoma. Fig. 104 venter. Fig. 105 tectum. Fig. 106 chelicera.
Fig. 107 venter of gnathosoma. Fig. 108 trochanter of leg IV.

The tectum is three-pronged (Text-fig. 105). The pedipalp is essentially similar to that of the male. The dorsal seta of the fixed digit is pilose ; the movable digit of the chelicera is tridentate (Text-fig. 106). The structure of the gnathosoma is shown in Text-fig. 107.

The tibia, tarsus and prae-tarsus of leg I are 183–187μ, 254–258μ and 17–21μ long respectively. The trochanter of leg IV may be with or without any processes (Text-fig. 108).

DISTRIBUTION AND HABITAT. This species has been recorded from Holland (Oudemans, 1902), Germany, Norway (Berlese, 1906), and Swedish Lapland (Trägårdh, 1910).

I have examined the following material : Litter and humus under pines and holly (near Duddleswell, Ashdown Forest, Sussex, K. H. Hyatt, 10.ix.1956). Moss and leaves (Adelaide Hill, Bowness, Cumberland, J. T. Salmon, 29.vi.1951). *Sphagnum*, etc. (Cock Hill, Yorkshire, J. T. Salmon, 21.vii.1951). In leaf mould (Epping Forest, Essex, J. T. Salmon, 27.v.1951). In leaf mould (Savernake Forest, Berkshire, J. T. Salmon, 26.ix.1951). In leaf mould (Forest of Dean, Gloucestershire, J. T. Salmon, 27.ix.1951), (Stratton Strawless, near Aylsham, Norwich, Norfolk, J. T. Salmon, 13.v.1951). In moss (Grassington, Grass Woods, North Riding, Yorkshire, J. T. Salmon, 24.vi.1951). *Sphagnum* (Ascot, Berkshire, A. H. G. Alston, 8.xii.1957). Moss on tree stumps and stones (Forest of Dean, Gloucestershire, J. T. Salmon, 27.ix.1951), (Red Bank, Grasmere, Westmorland, M. E. Bacchus, 3.xii.1954). In oak and beech leaf mould (Grasmere, Westmorland, J. T. Salmon, 26.vi.1951). In leaf mould (Boltons Wood, Boltons Abbey, North Riding, Yorks., J. T. Salmon, 24.vi.1951). In leaf mould (Burnham Beeches, Buckinghamshire, J. T. Salmon, 3.v.1951). *Sphagnum*, etc. (Moel Siabod, North Wales, P. N. Lawrence, 22.x.1960). Rotten stump (Gwydyr Forest, North Wales, P. N. Lawrence, 22.x.1960). Oak humus (Gwydyr Forest, North Wales, P. N. Lawrence, 22.x.1960). In moss (Tarbert, Crianlarich, Loch Lomond, Dunbarton, J. T. Salmon, 3.vii.1951). Floor of scotch fir wood (Aviemore, Inverness, J. T. Salmon, 7.vii.1951). In moss and heather (Glen Garry, Perth, Meall Doire and Daimh, J. T. Salmon, 5.vii.1951).

BIOLOGICAL NOTES. Two females collected from oak litter were reared under laboratory conditions. Twenty eggs were laid by one female and twenty-two eggs by the other. The female which laid twenty eggs lived for eighty-eight days in culture. The eggs are smooth and considerably smaller in size than those of *P.* (*P.*) *crassipes* or *P.* (*P.*) *septentrionalis*. The eggs hatched in three to five days (average 4·5 days) after deposition and the active feeding larval stage lasted five to seventeen days (average 9·08 days). The duration of the protonymphal and deutonymphal stages was seven to fifteen (average 10·18 days) and fourteen to twenty-three (average 20·0) days, respectively. Both these instars were active and fed voraciously on Collembola. Cannibalism was also noted.

The eight deutonymphs reared all moulted to give males. These males resembled the parent female in lacking a tubercle on the trochanter of leg IV. There were no tubercles on the trochanters of the pedipalps in the reared males.

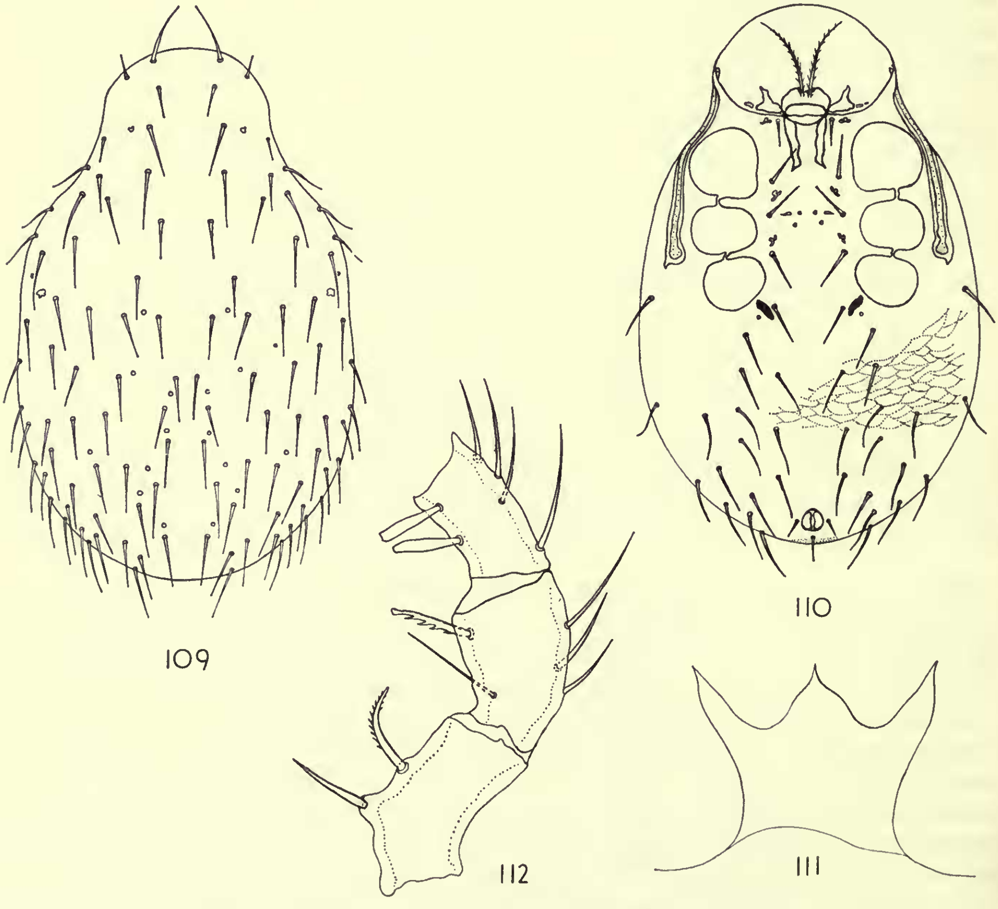
Pergamasus (Paragamasus) alpestris Berlese

Gamasus (*Pergamasus*) *alpestris* Berlese, A. (1904). *Redia* **1** : 236 ; Berlese, A. (1906). *Redia* **3** : 220, figs.

Pergamasus alpestris : Cooreman, J. (1954). *Bull. Inst. roy. Sci. nat. Belg.* **30,** 34 : 5, figs. Halašková, V. (1959) *Zvlástni Otisk Mus. Zprávy Pražského Kraje* **4** : 3, figs. ; Schweizer, J. (1961) *Denks. schweiz. naturf. Ges.* **84** : 63, figs.

MALE. The dorsum is dark brown in colour and sub-globular in shape. The dorsal shield (1,150–1,190μ long × 632–648μ wide) has no transverse suture and the lengths of the dorsal setae are variable (Text-fig. 109).

The prae-endopodal shields and the shape of the genital lamina are shown in Text-fig. 110. The tritosternum has an extremely reduced base and a pair of pilose laciniae.



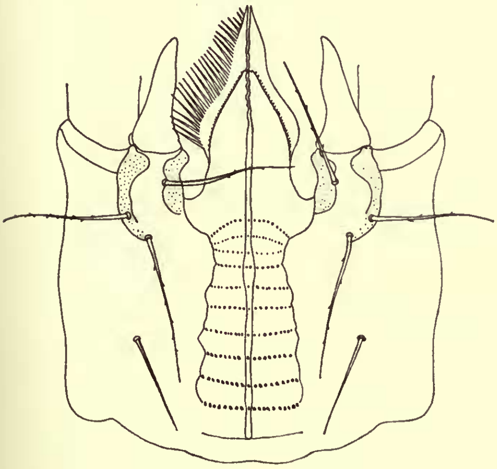
FIGS. 109–112. *Pergamasus* (*Paragamasus*) *alpestris* Berlese, male. Fig. 109 dorsum of idiosoma. Fig. 110 venter. Fig. 111 tectum. Fig. 112 trochanter, femur and genu of pedipalp.

The venter is very characteristic ; a scaly, elongated structure is situated near the coxa of leg IV. The setation of the opisthogastral shield is figured. The stigma is situated between the coxae III and IV ; and the peritreme extends to coxa I. A pair of relatively long post-stigmatal setae is present.

The tectum is three-pronged and situated on a cup-like structure (Text-fig. 111). The distinctive features of the pedipalp and chelicerae are shown in Text-figs. 112 and 113 respectively. The corniculus is distinctly stalked ; and the hypostomal process fringed (Text-fig. 114). The deutosternal denticles are arranged in ten transverse rows.

The tibia, tarsus and prae-tarsus of leg I are 204–208μ, 300–304μ and 21–25μ long respectively. Leg II, with coxa, trochanter, femur, genu and tibia, is armed with variously shaped spurs (Plate 2f). Leg II is remarkable for the presence of a spur on the coxa (Plate 2e). The femur is crassate with a well-developed falcate major spur and accessory spurs. The armature of the trochanter of leg IV is shown in Text-fig. 115.

FEMALE. The dorsal shield (1,117–1,132μ long × 732μ wide) is broadly oval and regionally reticulated (Text-fig. 116). Lengths of the dorsal setae are greatly variable. The posterior half of the shield bears about twenty-nine pairs.



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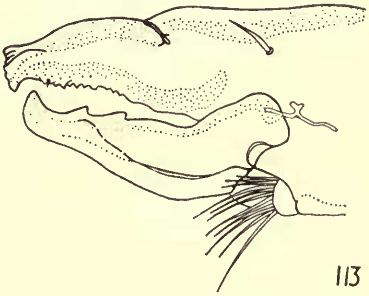

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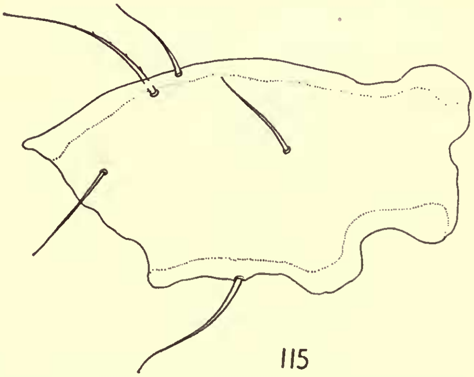

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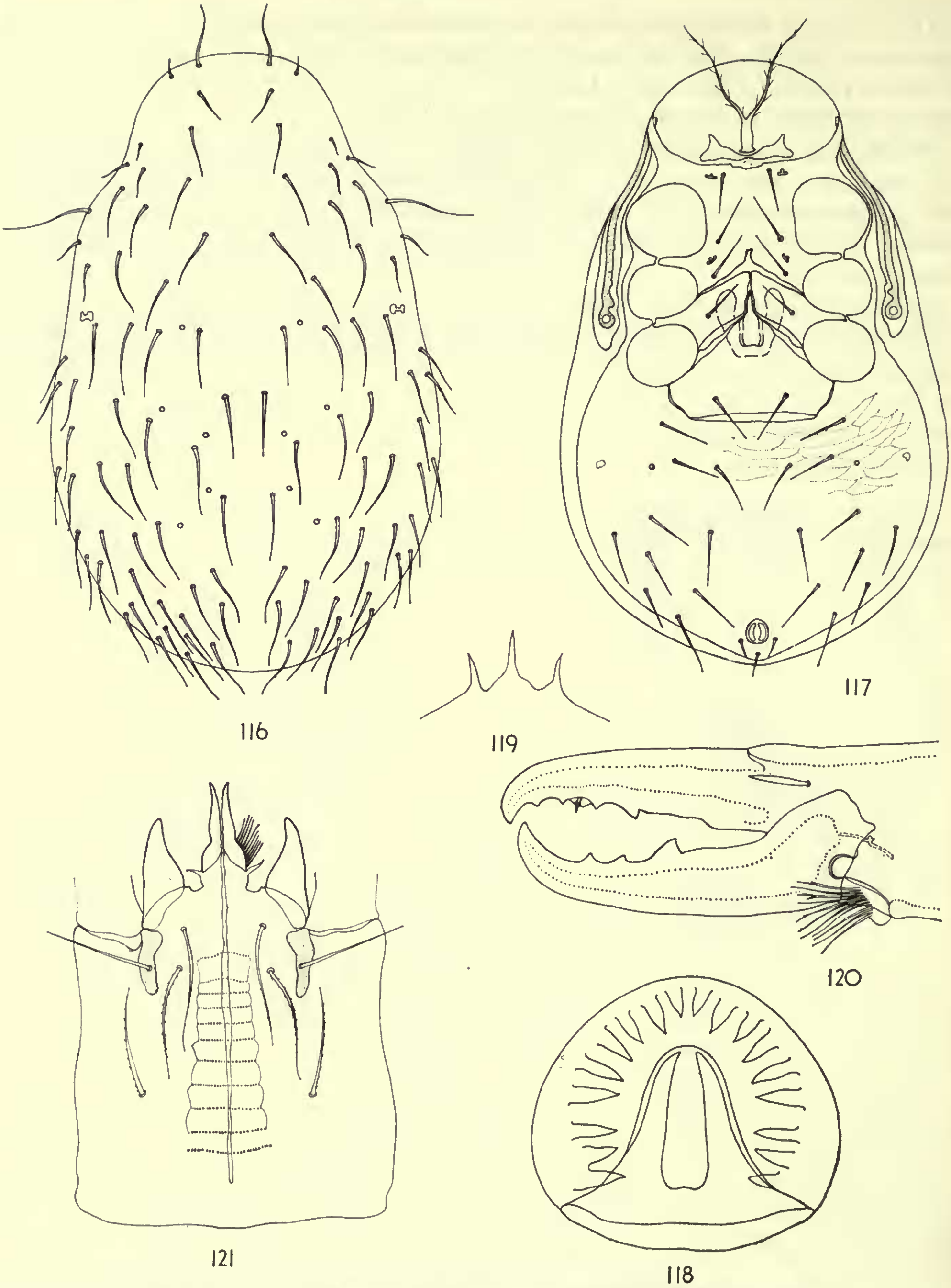
FIGS. 113–115. *Pergamasus* (*Paragamasus*) *alpestris* Berlese, male.
Fig. 113 chelicera. Fig. 114 venter of gnathosoma. Fig. 115 trochanter of leg IV.



FIGS. 116–121. *Pergamasus* (*Paragamasus*) *alpestris* Berlese, female.
Fig. 116 dorsum of idiosoma. Fig. 117 venter. Fig. 118 endogynial process. Fig. 119 tectum. Fig. 120 chelicera. Fig. 121 venter of gnathosoma.

Ventrally, the tritosternum has an elongated basal part and a pair of well-developed pilose laciniae. There is a pair of large prae-endopodal shields which are coalesced in the median line. The metasternal shields are free (Text-fig. 117). The endogynium has a pair of horns. The endogynial process is complicated (Text-fig. 118). The genital shield is as seen in Plate 7f. The opisthogastral shield is furnished with ten pairs of setae (excepting paranal and post-anal setae) of variable length. The stigma is in the normal position with the anterior prolongation of the peritreme to coxa I.

The tectum is three-pointed (Text-fig. 119). The chelicera is shown in Text-fig. 120. The proximal half of the hypostomal margins are fringed. The deutosternal denticles are arranged in parallel transverse rows (Text-fig. 121).

The tarsus (287–289μ) of leg I is considerably longer than the tibia (187–196μ). The prae-tarsus (29–30μ) is long.

DISTRIBUTION AND HABITAT. This species is previously known from Italy (Berlese, 1904, 1906), Belgium (Cooreman, 1954), Czechoslovakia (Halašková, 1959), Switzerland (Schweizer, 1961).

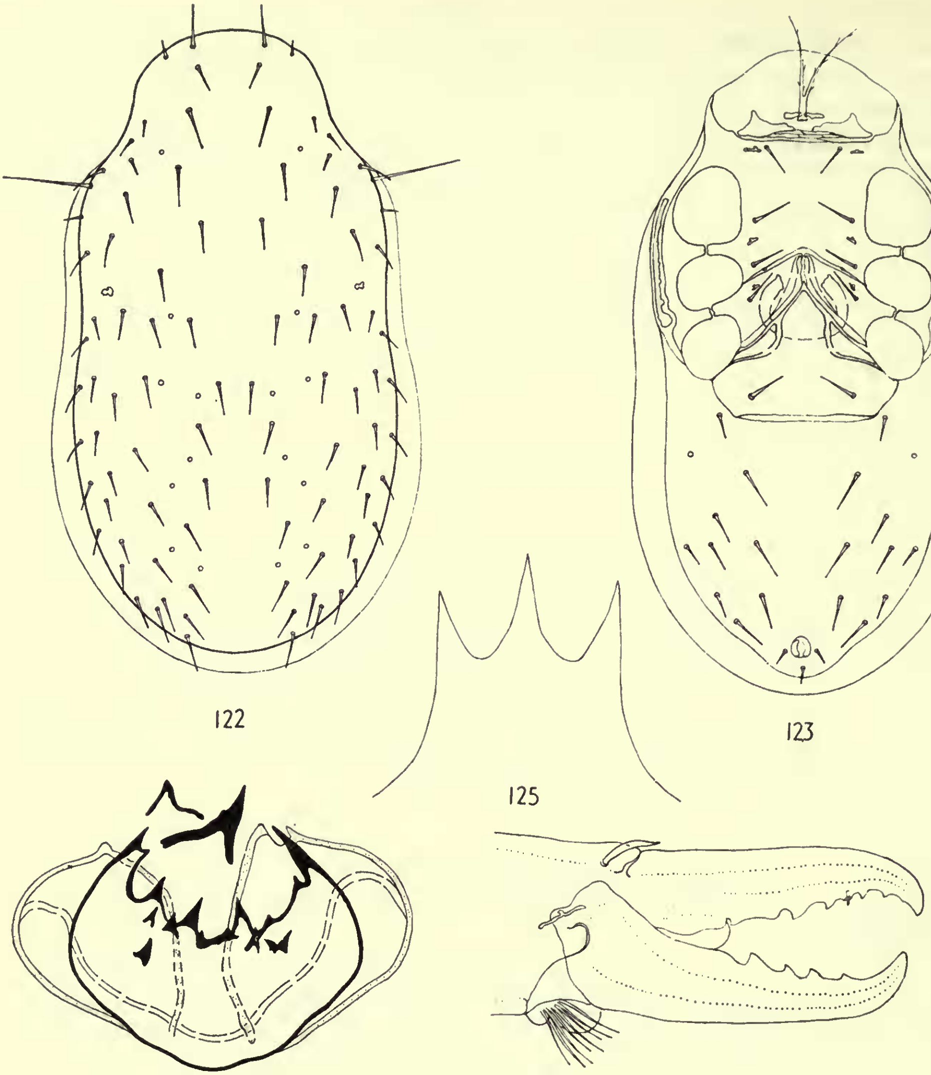
I have examined material from moss on tree stumps and stones (Forest of Dean, Gloucestershire, J. T. Salmon, 27.ix.1951 ; Red Bank, Grasmere, Westmorland, M. E. Bacchus, 3.xii.1954) ; peat (Blackbush, Kew, Surrey, A. H. G. Alston, 18.i.1958) ; moss from crevices in rocks (near Force Forge, Westmorland, M. E. Bacchus, 2.xii.1954) ; leaf mould (Boltons Wood, Boltons Abbey, North Riding, Yorks., J. T. Salmon, 24.vi.1951) ; in moss of wall (Tarn Howes, North Lancashire, M. E. Bacchus, 4.xii.1954) and yew and rhododendron humus (Educational Garden, Swansea University, P. N. Lawrence, 26.iii.1962).

Pergamasus (Paragamasus) alstoni sp. nov.

MALE. Unknown.

FEMALE. The dorsal shield (622–648μ long × 350–357μ wide) is sclerotized, regionally reticulated and yellow in colour. The setation of the dorsal shield is shown in Text-fig. 122.

The tritosternum has a pair of pilose laciniae. The distribution of the prae-endopodal shields is characteristic (Text-fig. 123). The interscutal membrane between the anterior margin of the sternal shield and the large prae-endopodal shields is striated. The metasternal shields are free. The endogynium has a pair of horns and its process is remarkable in shape and structure (Text-fig. 124). The genital shield is shown in Plate 7g. The opisthogastral shield has nine pairs of setae (excepting three setae associated with the anus). The stigma is situated between coxae III and IV ; and the peritreme extends as far as the level of coxa II. The peritrematal shield is characteristically fused with the exopodal and opisthogastral shields. The posterior extremity of the peritrematal shield curves inwards in a tubular form to meet coxa IV.



FIGS. 122–126. *Pergamasus* (*Paragamasus*) *alstoni* sp. nov., female. Fig. 122 dorsum of idiosoma. Fig. 123 venter. Fig 124. endogynial process. Fig. 125 tectum. Fig. 126 chelicera.

The tectum is three-pronged (Text-fig. 125). The distinctive features of the pedipalp are : femur with a comb-like seta and genu with two spatulate setae. The dentition and shape of the chelicera are shown in Text-fig. 126. The ventral groove of the gnathosoma possesses ten or eleven rows of deutosternal denticles.

The tibia, tarsus and prae-tarsus of leg I are 95–102μ, 150–154μ and 12–17μ long respectively. The trochanter of leg IV is devoid of a tubercle.

HABITAT. I have examined three females from soil in filmy-fern house (Royal Physic Garden, Chelsea, London, A. H. G. Alston, January, 1956) and a single female from yew and rhododendron humus (Educational Garden, Swansea University, Swansea, P. N. Lawrence, 26.iii.1962).

I have designated a female from the Royal Physic Garden, Chelsea, London (Coll. A. H. G. Alston, January, 1956) as the Holotype (1963.2.7.16).

Pergamasus (Paragamasus) armatus Halbert

Gamasus (*Pergamasus*) *runciger* Berl. var. *armatus* Halbert, J. N. (1915). *Proc. R. Irish Acad.* **31** 39 ii : 51, figs.

MALE. The dorsal shield (838–898µ long × 433µ wide) is provided with a median transverse suture. The anterior dorsal shield is furnished with twenty-one pairs of setae and the setation of the posterior half is shown in Text-fig. 127.

The placement of the prae-endopodal shields and the shape of the genital lamina is shown in Text-fig. 128. The tritosternum has a reduced basal part and a pair of ciliated laciniae. The setation of the opisthogastral shield is shown in the figure. The stigma is situated between coxae III and IV ; the peritreme extends to coxa I. A pair of post-stigmatal setae is present.

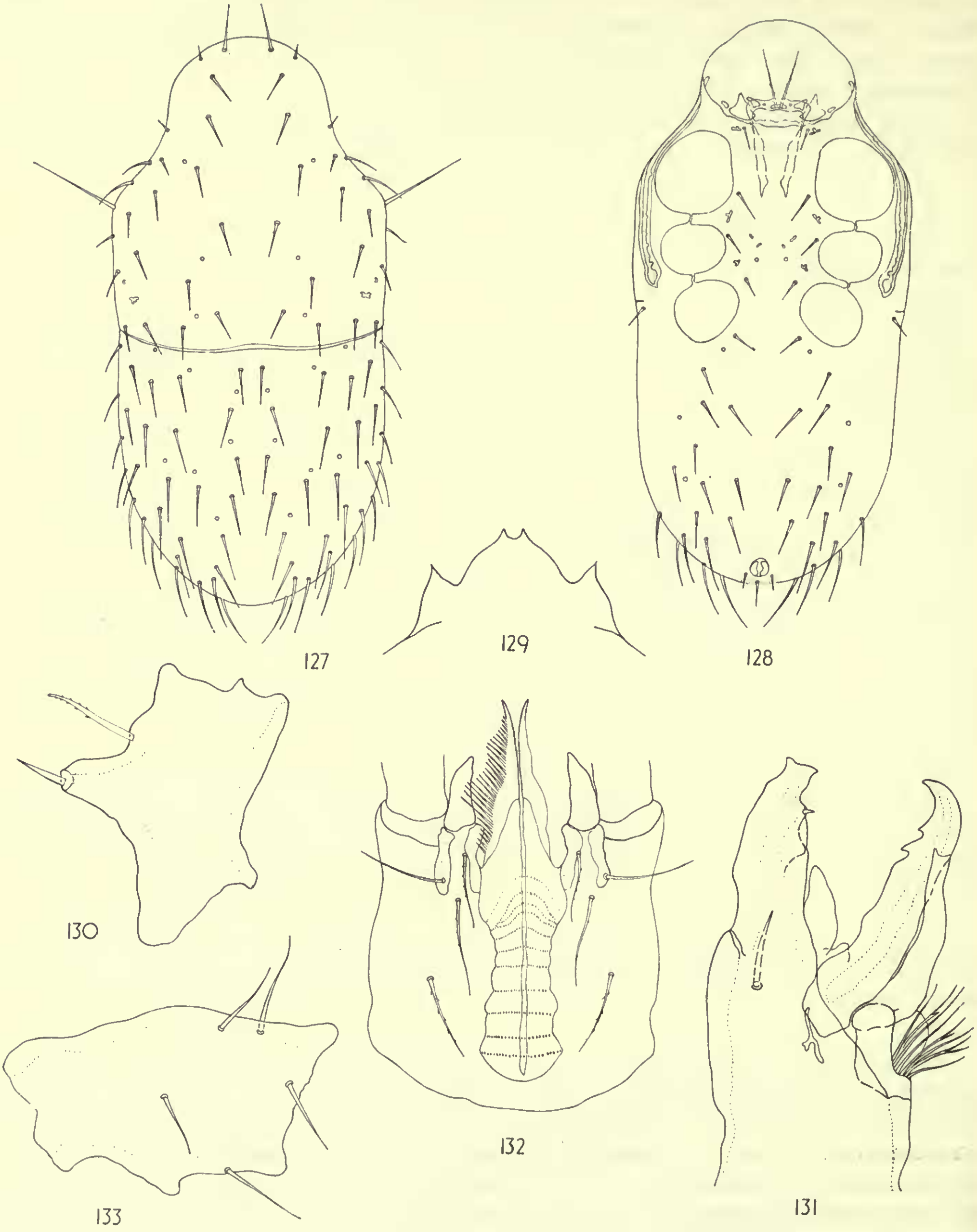
The tectum is shown in Text-fig. 129. The palpal trochanter has a large seta-bearing protuberance (Text-fig. 130) ; the femur and genu are provided with one comb-like and two spatulate setae, respectively. The chelicera is shown in Text-fig. 131. The corniculus is distinctly stalked. Almost the entire lateral margins of the hypostomal processes are fringed. The deutosternal denticles on the ventral groove of the gnathosoma are shown in Text-fig. 132.

The tibia, tarsus and prae-tarsus of leg I are 121–150µ, 150–210µ and 17–25µ long respectively. The armature of the femur, genu, tibia and tarsus of leg II is of special interest (Plate 2g). The femur is strongly crassate and has a large falcate main spur and an accessory spur. The trochanter of leg IV is armed with a tubercle (Text-fig. 133).

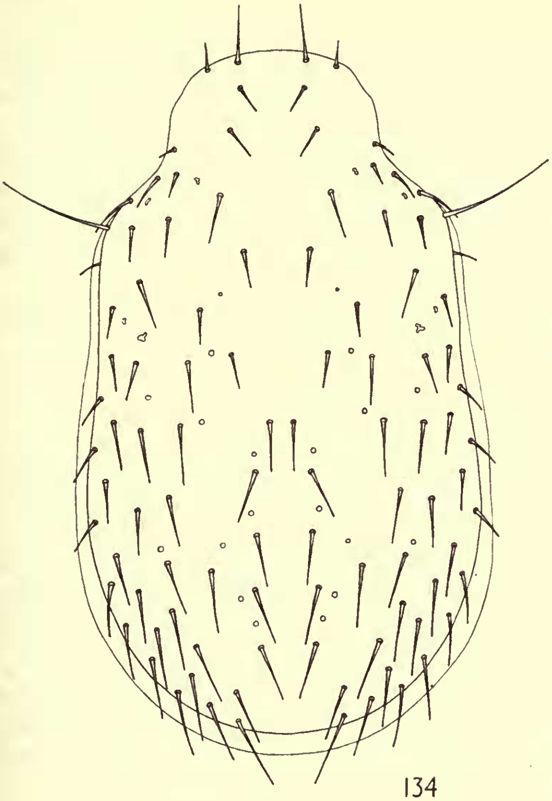
FEMALE. The dorsal shield (882–898µ long × 467–500µ wide) is well sclerotized and not entirely reticulated. The anterior half of the dorsal shield as usual bears twenty-one pairs of setae, and the posterior half is with twenty-nine pairs (Text-fig. 134).

Ventrally, the tritosternum has an elongated basal part, and a pair of ciliated laciniae. There are several pairs of prae-endopodal shields some of which are small. The interscutal membrane, between the anterior margin of the sternal shield and the prae-endopodal shields, is striated (Text-fig. 135). The endogynium consists of a pair of horns. The genital shield is shown in Plate 8c. The opisthogastral shield has ten pairs of setae (excepting a post-anal and a pair of paranal setae). The stigma is situated between the coxae III and IV, and the peritreme extends to the level of coxa I.

The tectum is three-pronged (Text-fig. 136). The distinctive features of the pedipalp are the femur with a comb-like seta and the genu with spatulate setae. The



FIGS. 127–133. *Pergamasus* (*Paragamasus*) *armatus* Halbert, male.
Fig. 127 dorsum of idiosoma. Fig. 128 venter. Fig. 129 tectum. Fig. 130 trochanter of pedipalp. Fig. 131 chelicera. Fig. 132 venter of gnathosoma. Fig. 133 trochanter of leg IV.



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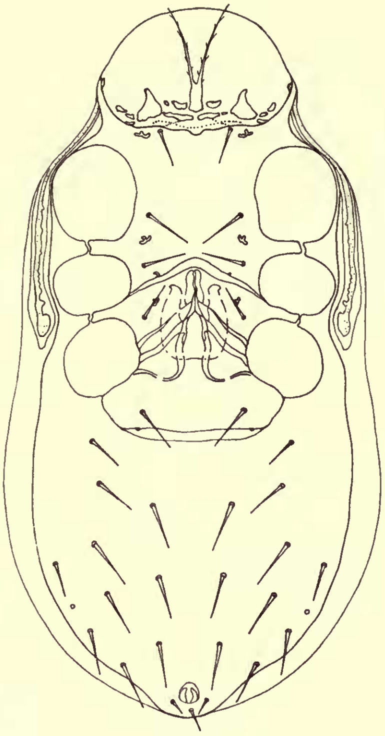

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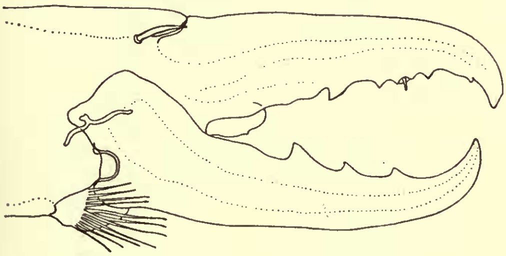

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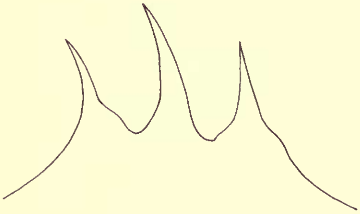


136

FIGS. 134–137. *Pergamasus* (*Paragamasus*) *armatus* Halbert, female.
Fig. 134 dorsum of idiosoma. Fig. 135 venter. Fig. 136 tectum. Fig. 137 chelicera.

proximal half of the hypostomal process is fringed. The chelicera is as figured (Text-fig. 137).

The tibia, tarsus and prae-tarsus of leg I are 116–150μ, 154–183μ and 8–17μ long respectively. The trochanter of leg IV is without a tubercle.

DISTRIBUTION AND HABITAT. The female of the species is previously known from Ireland only (Halbert, 1915).

I have examined material from : hornbeam humus (Bookham Common, Surrey, Mrs. R. E. Teagle, xi.1956). In oak and beech leaf mould (Grasmere, Westmorland, J. T. Salmon, 26.vi.1951). Algae and rushes (Colletts Bridge, Norfolk, P. N. Lawrence, 16.x.1960). In beech leaf mould from steep bank (Rickmansworth, Herts., M. E. Bacchus, 25.ii.1951). Beech leaf mould (Amersham, Buckinghamshire, M. E. Bacchus, 13.v.1951). Inside bark of fallen elm tree (Harefield, Middlesex, A. H. G. Alston, 22.i.1956). Rotten reeds (Colletts Bridge, Norfolk, P. N. Lawrence).

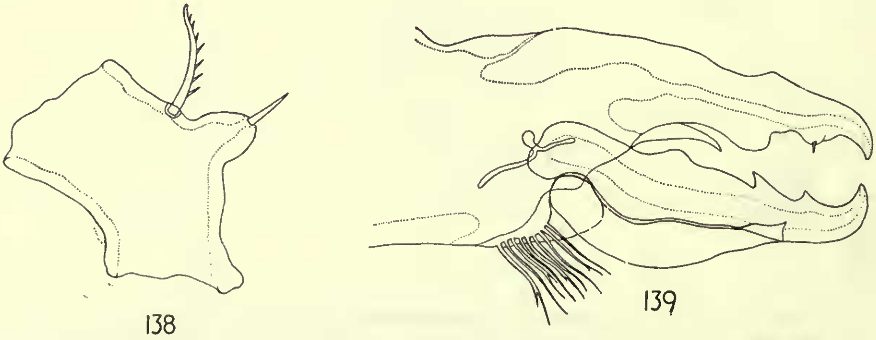
Moss on trees and humus (Hen Parc Wood, Killay nr. River Clyne, nr. Swansea, Wales, P. N. Lawrence, 24.iii.1962).

Pergamasus (*Paragamasus*) *cambriensis* sp. nov.

MALE. The dorsal shield measures 490–500μ long × 240–250μ wide and is provided with a transverse suture. The anterior region of the dorsal shield bears twenty-one pairs of setae.

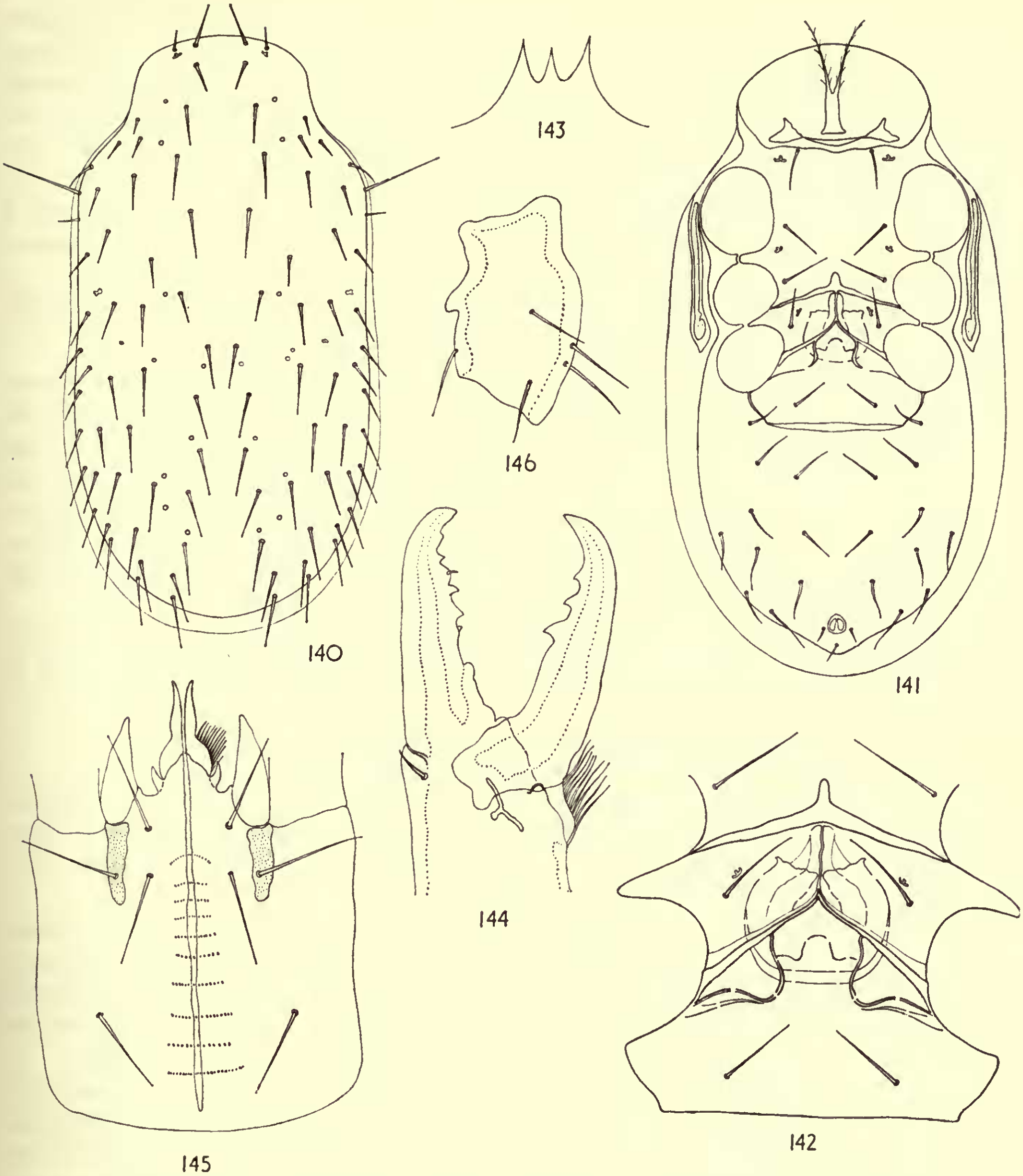
The tritosternum has a short basal part with a pair of pilose laciniae. A pair of large prae-endopodal shields is present. The genital lamina resembles that of *P. wasmanni* Oudemans. The stigma is situated between coxae III and IV ; and the peritreme extends to coxa II. A pair of post-stigmatal setae is present.

The tectum is three-pronged, the median tine being shorter than the lateral ones. The palpal trochanter has a seta-bearing tubercle (Text-fig. 138). The chelicera is shown in Text-fig. 139. The corniculus is distinctly stalked, and the entire lateral margins of the hypostomal processes are fringed.



FIGS. 138–139. *Pergamasus* (*Paragamasus*) *cambriensis* sp. nov., male. Fig. 138 trochanter of pedipalp. Fig. 139 chelicera.

Leg I with the tibia, tarsus and prae-tarsus 66–70μ, 116–129μ and 8–12μ long, respectively. The femur, genu and tibia of leg II are armed with spurs (Plate 3a). The genual spur is characteristic in shape and position. The trochanter of leg IV is tuberculated.



FIGS. 140–146. *Pergamasus* (*Paragamasus*) *cambriensis* sp. nov., female. Fig. 140 dorsum of idiosoma. Fig. 141 venter. Fig. 142 magnified structure of the sterniti-genital region. Fig. 143 tectum. Fig. 144 chelicera. Fig. 145 venter of gnathosoma. Fig. 146 trochanter of leg IV.

FEMALE. The dorsal shield (515–548μ long × 267–300μ wide) is sclerotized and yellow in colour. The setation of the dorsal shield is shown in Text-fig. 140.

The tritosternum has an elongated basal part and a pair of pilose laciniae. A narrow elongated strip of prae-endopodal shield is situated in between large prae-endopodal shields (Text-fig. 141). The metasternal shields are free. The genital region is as in Text-fig. 142, and the genital shield in Plate 8d. The opisthogastral shield with ten pairs of setae. Although the peritrematal shield is fused with the dorsal shield at the level of coxa I the peritreme only extends to coxa II. The position of the stigma is the same as in the male.

The tectum is three-pronged (Text-fig. 143). The dentition of the chelicera is shown in Text-fig. 144. The deutosternal denticles are arranged in ten transverse rows.

Leg I with the tibia, tarsus and prae-tarsus 78–87μ, 125–137μ and 8–12μ long respectively. The trochanter of leg IV is shown in Text-fig. 146.

HABITAT. Two males and three females from hornbeam humus (Bookham Common, Surrey, Mrs. R. E. Teagle, xi.1956), two females from beech leaf mould (Amersham, Buckinghamshire, M. E. Bacchus, 13.v.1951). Three females in soil (between Rockingham and Corby, Northants, B. N. K. Davis, 14.i.1958). Six males and thirteen females from litter under thick evergreen hedge (St. Agnes, Isles of Scilly, Cornwall, K. H. Hyatt, 29.iii.1957). Two females from pine litter (Clyne Park, Swansea, S. K. Bhattacharyya, 4.i.1961). Two females from oak litter (Llew Reservoir, Swansea, S. K. Bhattacharyya, 2.i.1961).

I have designated a male and female from Bookham Common, Surrey (Coll. Mrs. R. E. Teagle, xi.1956) as the Holotype (1963.2.7.1) and Allotype (1963.2.7.2) respectively.

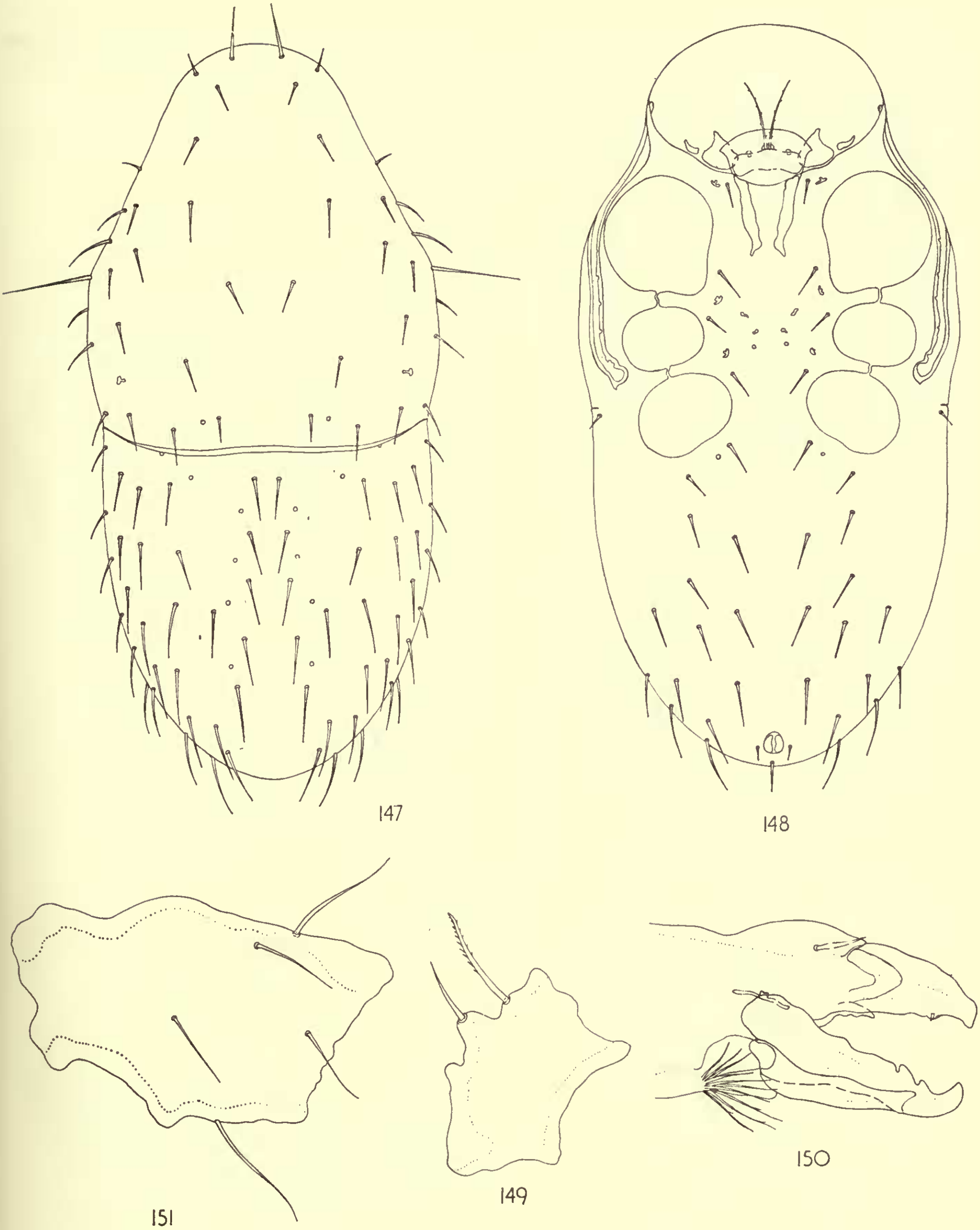
Pergamasus (Paragamasus) cassiteridum sp. nov.

MALE. This species is strongly sclerotized and dark brown in colour. The dorsal shield (86–88μ long × 433–467μ wide) has a transverse suture (Text-fig. 147). The anterior dorsal shield bears twenty-one pairs of setae, whilst the posterior half about twenty-six pairs of setae.

The tritosternum has a reduced base with a pair of pilose laciniae. The anteriormost margin of the genital lamina is convex in shape. The distribution of the prae-endopodal shields and the setation of the opisthogastral shield is shown in Text-fig. 148. The stigma is situated between coxae III and IV ; the peritreme anteriorly extends as far as the level of coxa I. A pair of post-stigmatal setae is present.

The tectum is three-pronged. The most distinctive features of the pedipalp are, the trochanter with two tubercles (Text-fig. 149), the femur with a comb-like seta and the genu with two spatulate setae. The dentition of the chelicera and the form of the spermadactyl process is shown in Text-fig. 150. There are distinctly stalked corniculi. The entire lateral margins of the hypostomal processes are fringed.

The tibia, tarsus and prae-tarsus of leg I are 121–129μ, 145–154μ and 17μ long respectively. The trochanter, femur and genu of leg II are armed with variously shaped processes (Plate 3c–e). The femur is crassate. The tibial spur is smaller than in *robustus* and the distal end has a prominence. The armature of the trochanter of leg IV is delineated in Text-fig. 151.

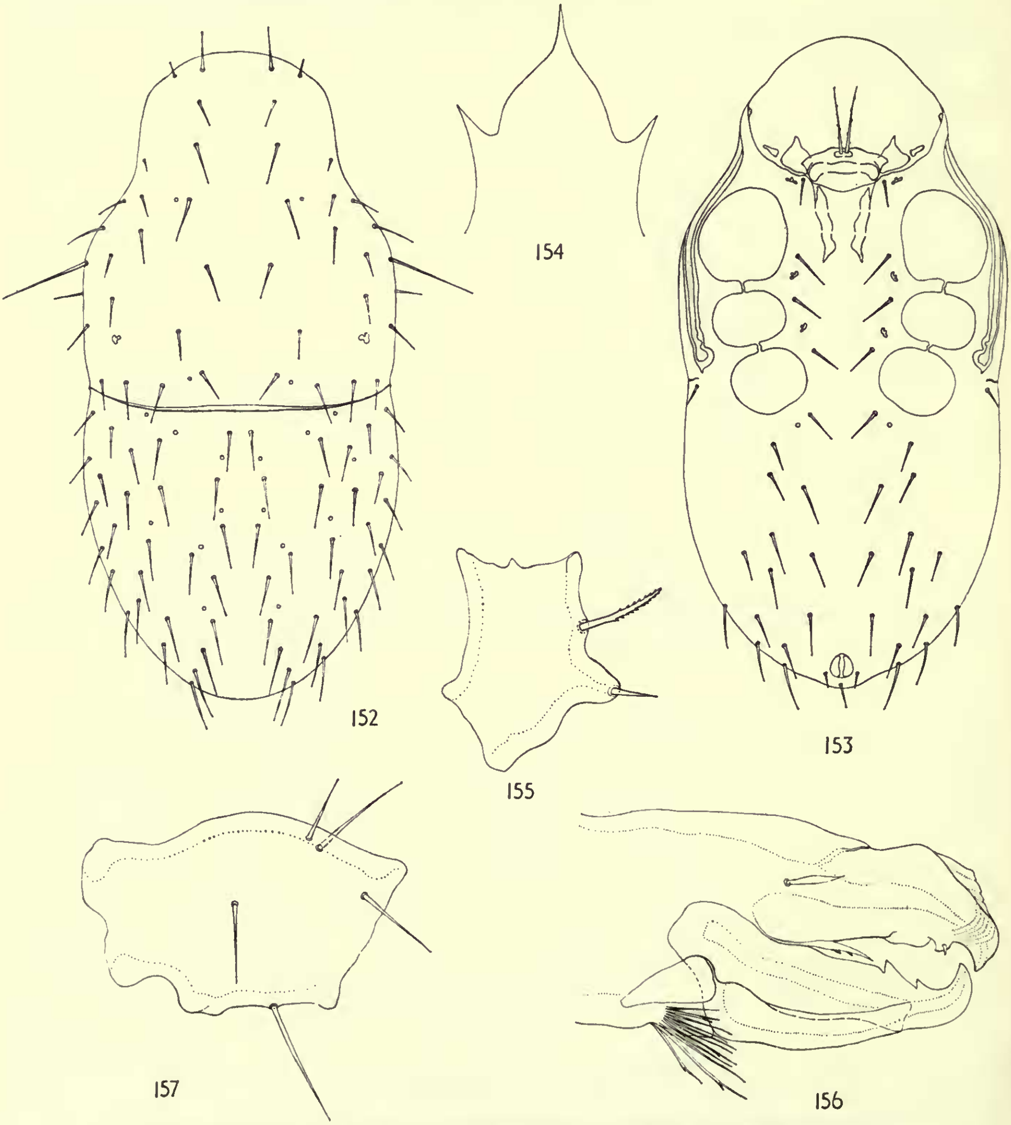


FIGS. 147–151. *Pergamasus* (*Paragamasus*) *cassiteridum* sp. nov., male. Fig. 147 dorsum of idiosoma. Fig. 148 venter. Fig. 149 trochanter of pedipalp. Fig. 150 chelicera. Fig. 151 trochanter of leg IV.

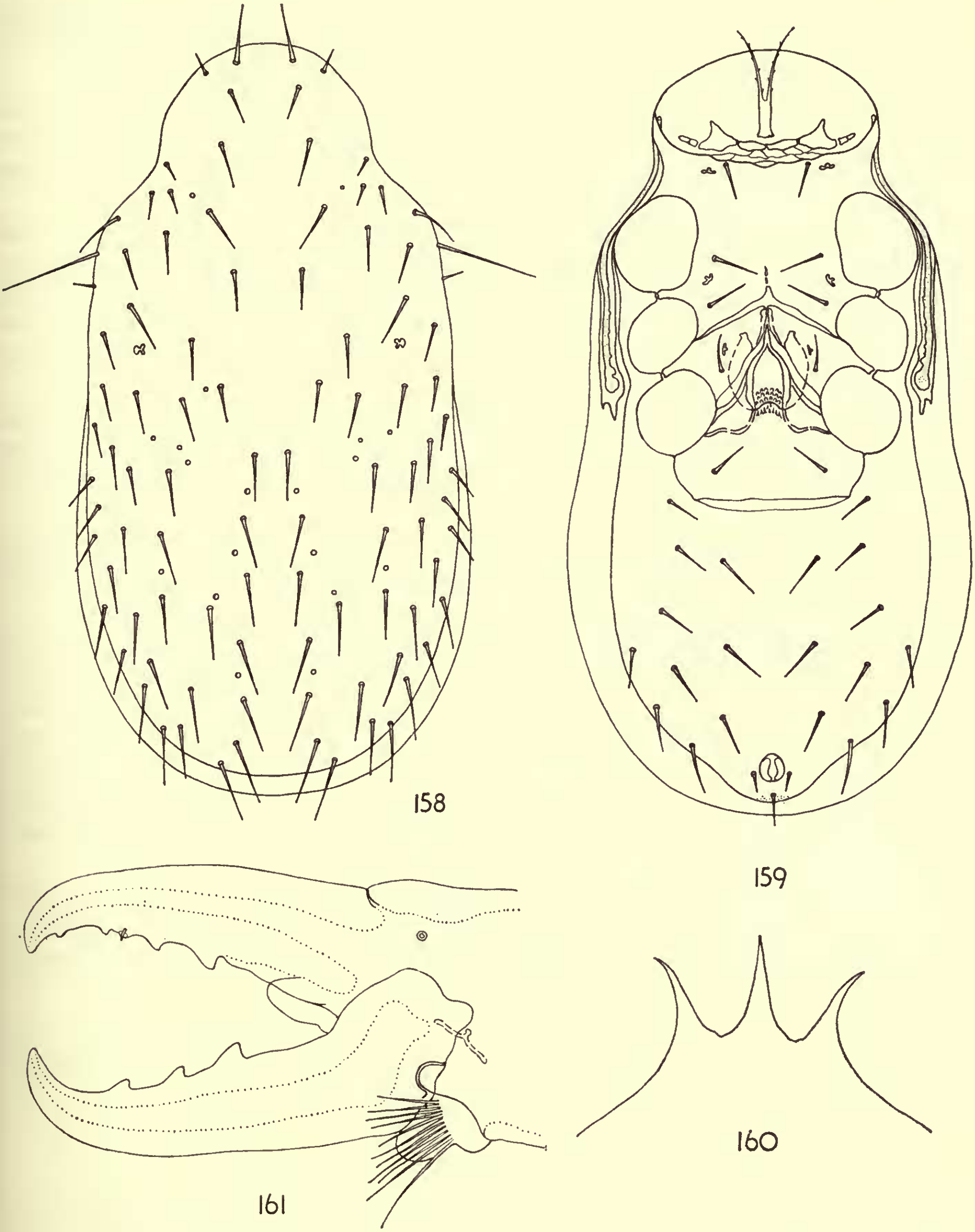
FEMALE. Unknown.

HABITAT. One male from litter under thick evergreen hedge, St. Agnes, Isles of Scilly, Cornwall, K. H. Hyatt, 29.iii.1957, and two males from lichens in crevices, Moel Siabod, North Wales, P. N. Lawrence, 22.x.1960.

I have designated the male from St. Agnes, Isles of Scilly, Cornwall (Coll. K. H. Hyatt, 29.iii.1957) as the Holotype (1963.2.7.7).



FIGS. 152–157 *Pergamasus* (*Paragamasus*) *celticus* sp. nov., male.
Fig. 152 dorsum of idiosoma. Fig. 153 venter. Fig. 154 tectum. Fig. 155 trochanter of pedipalp. Fig. 156 chelicera. Fig. 157 trochanter of leg IV.



FIGS. 158-161. *Pergamasus* (*Paragamasus*) *celticus* sp. nov., female.
Fig. 158 dorsum of idiosoma. Fig. 159 venter. Fig. 160 tectum. Fig. 161 chelicera.

Pergamasus (Paragamasus) celticus sp. nov.

MALE. The dorsal shield measures 732–747μ long and 367μ wide and is provided with a transverse suture (Text-fig. 152). The dorsum bears about forty-nine pairs of setae of which twenty-one pairs are situated on the anterior dorsal shield.

Ventrally, the tritosternum has a pair of pilose laciniae. The distribution of the prae-endopodal shields and the shape of the genital lamina are shown in Text-fig. 153. The stigma is situated between coxae II and IV and the peritreme reaches to coxa I. A pair of post-stigmatal setae is present.

The tectum is three-pronged (Text-fig. 154). The distinctive features of the pedipalp are, the trochanter has a seta-bearing process (Text-fig. 155), the femur a comb-like seta and the genu two spatulate setae. The characteristic shape of the fixed digit and the dentition of the chelicera are shown in Text-fig. 156. The corniculus is distinctly stalked. The entire lateral margins of the hypostomal processes are fringed.

Leg I is with the tibia, tarsus and prae-tarsus 100–133μ, 168–175μ and 16–21μ long, respectively. The trochanter of leg II lacks a spur but the femur, genu and tibia are armed with variously shaped processes (Plate 3g). The trochanter of leg IV is shown in Text-fig. 157.

FEMALE. The dorsal shield (704–732μ long × 357–374μ wide) is well sclerotized and yellow in colour. The podonotal shield invariably bears twenty-one pairs of setae but the opisthonotal shield has about twenty-seven pairs (Text-fig. 158).

The tritosternum has an elongated basal part and a pair of pilose laciniae. The form of the prae-endopodal shield is shown in Text-fig. 159. Ventro-medially, the interscutal membrane between the anterior margin of the sternal and prae-endopodal shields is striated and granular. The metasternal shields are free. The endogynium has a pair of horns and its processes are delineated in Text-fig. 159. The epigynial shield is shown in Plate 8f. The opisthonotal shield is with ten pairs of setae. The position of the stigma and extension of the peritreme are similar to those in the male.

The tectum is three-pronged (Text-fig. 160). The chelicera is shown in Text-fig. 161. The ventral groove of the gnathosoma has nine or ten rows of denticles.

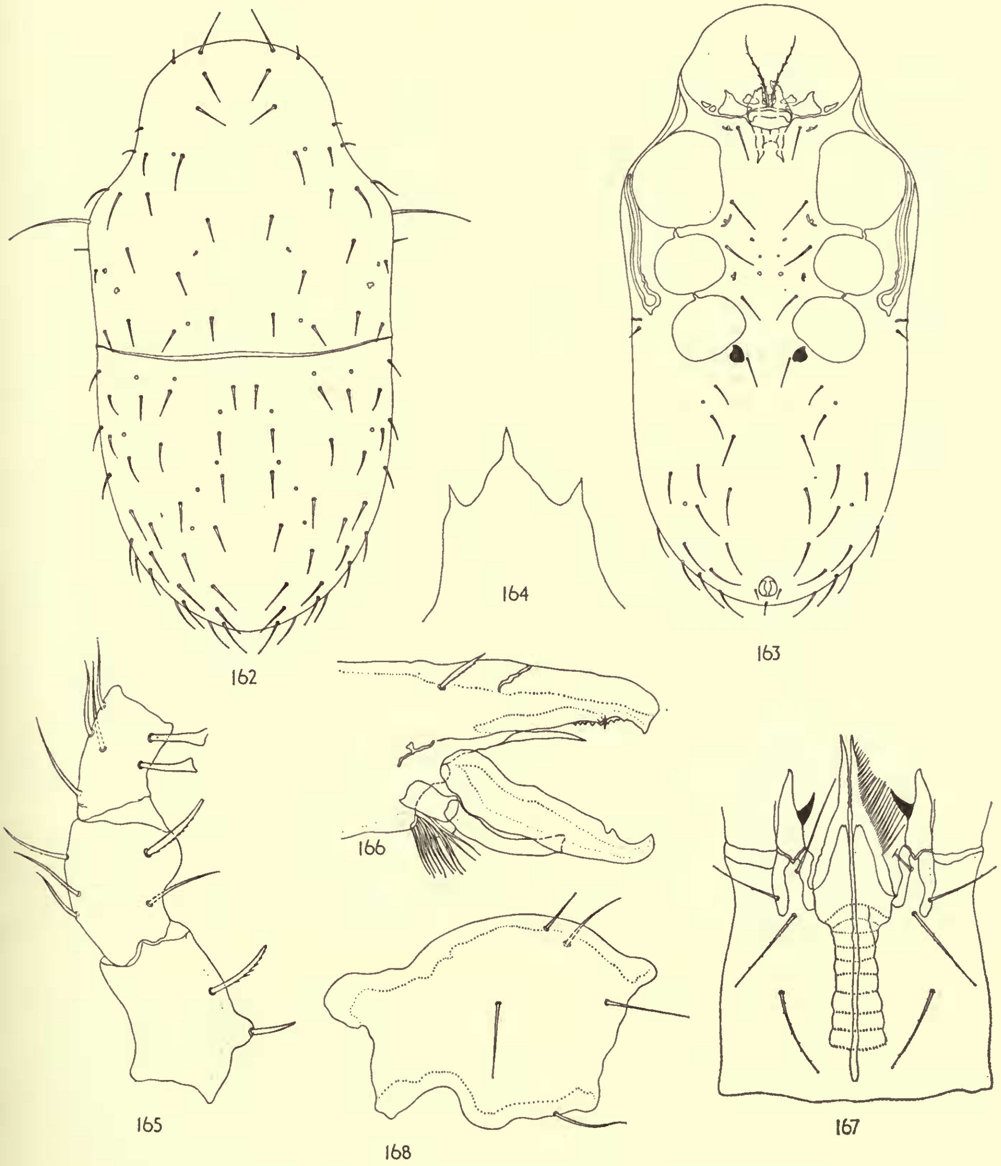
The tibia, tarsus and prae-tarsus of leg I are 112μ, 133–185μ and 10–12μ long, respectively. The trochanter of leg IV is without any process.

HABITAT. Three males and four females have been obtained from pines and rhododendrons (Parknasilla, Co. Kerry, Ireland, Miss T. Clay, 27.i.1953); Holotype male (1963.2.7.17) and Allotype female (1963.2.7.18).

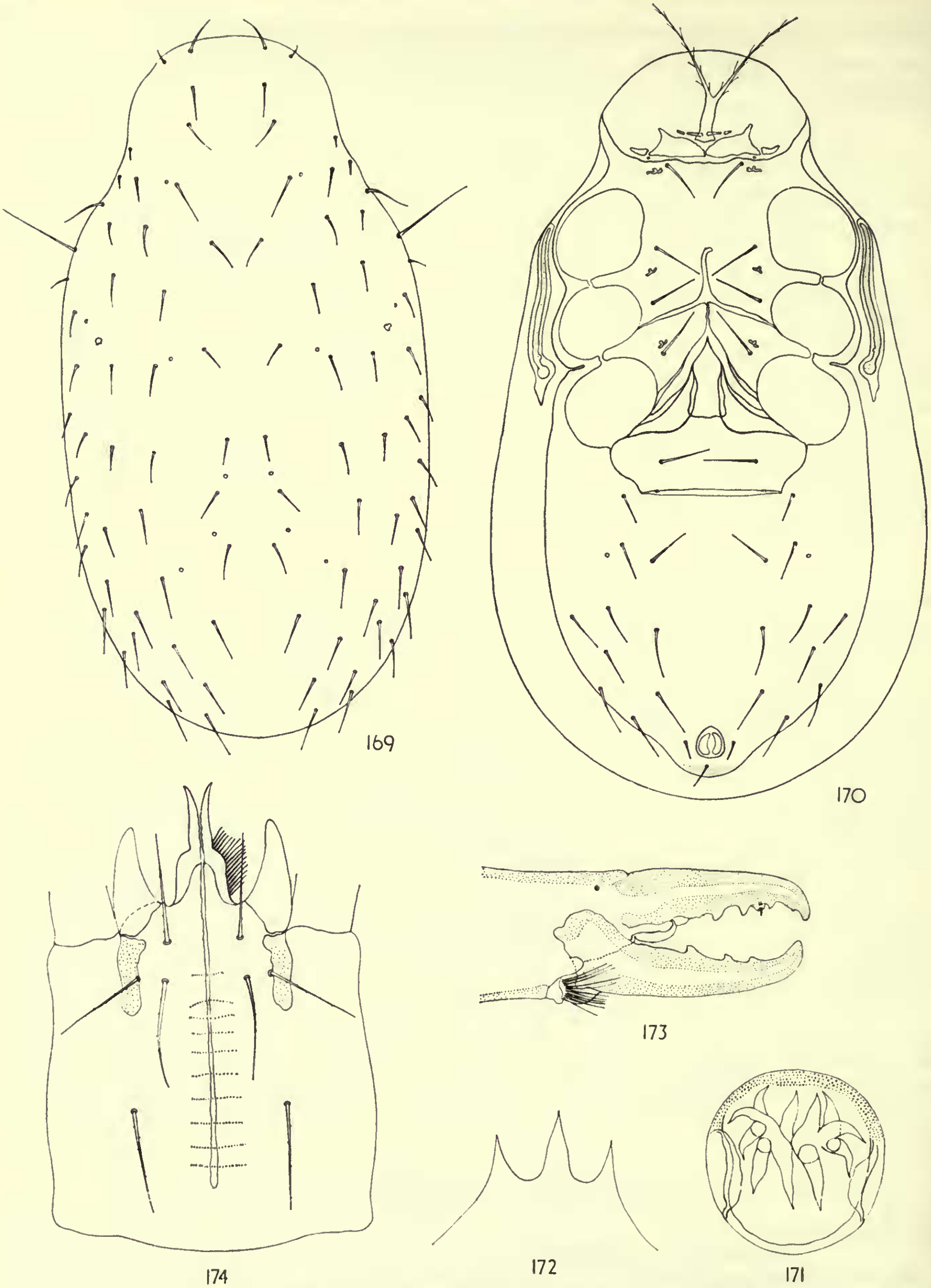
Pergamasus (Paragamasus) diversus Halbert

Gamasus (*Pergamasus*) *diversus* Halbert, J. N. (1915). *Proc. R. Irish Acad.* **31** 39 ii : **52,** figs.

MALE. The dorsal shield (831–898μ long × 400–440μ wide) is well sclerotized and provided with a transverse suture (Text-fig. 162). The anterior region of the dorsal shield is furnished with twenty-one pairs of setae and is regionally reticulated. The posterior region of the shield bears twenty-five pairs of setae and is entirely reticulated.



Figs. 162–168. *Pergamasus* (*Paragamasus*) *diversus* Halbert, male. Fig. 162 dorsum of idiosoma. Fig. 163 venter. Fig. 164 tectum. Fig. 165 trochanter, femur and genu of pedipalp. Fig. 166 chelicera. Fig. 167 venter of gnathosoma. Fig. 168 trochanter of leg IV.



Figs. 169–174. *Pergamasus* (*Paragamasus*) *diversus* Halbert, female. Fig. 169 dorsum of idiosoma. Fig. 170 venter. Fig. 171 endogynial process. Fig. 172 tectum. Fig. 173 chelicera. Fig. 174 venter of gnathosoma.

The tritosternum has a short basal part and a pair of pilose laciniae. The genital lamina is medially notched into two lobes which have serrated margins (Text-fig. 163). Between coxae IV are a pair of well sclerotized, scale-like structures. Each scale-like structure is associated with a seta. The stigma is situated between coxae III and IV ; the peritreme extends to coxa II. A pair of post-stigmatal setae is present.

The tectum is three-pronged (Text-fig. 164). The palpal trochanter has a seta-bearing process ; the femur and genu are provided with a comb-like and two spatulate setae respectively (Text-fig. 165). The chelicera is shown in Text-fig. 166. The corniculus is stalked and provided with a blade-like hyaline appendage (Text-fig. 167). The hypostomal process and deutosternal denticles are shown in the figure.

The tibia, tarsus and prae-tarsus of leg I are 125–158μ, 191–213μ and 12–17μ long, respectively. The femur of leg II is crassate with a strong falcate main spur and an accessory spur. The distal end of the femur also bears a tubular process. The genu lacks a process ; whilst the tibia bears a discoidal spur (Plate 3b). The trochanter of leg IV is shown in Text-fig. 168.

Female. The dorsal shield (831–847μ long × 433–450μ wide) is sclerotized. The anterior region of the dorsal shield has twenty-one pairs of setae and the posterior region about twenty-four pairs (Text-fig. 169).

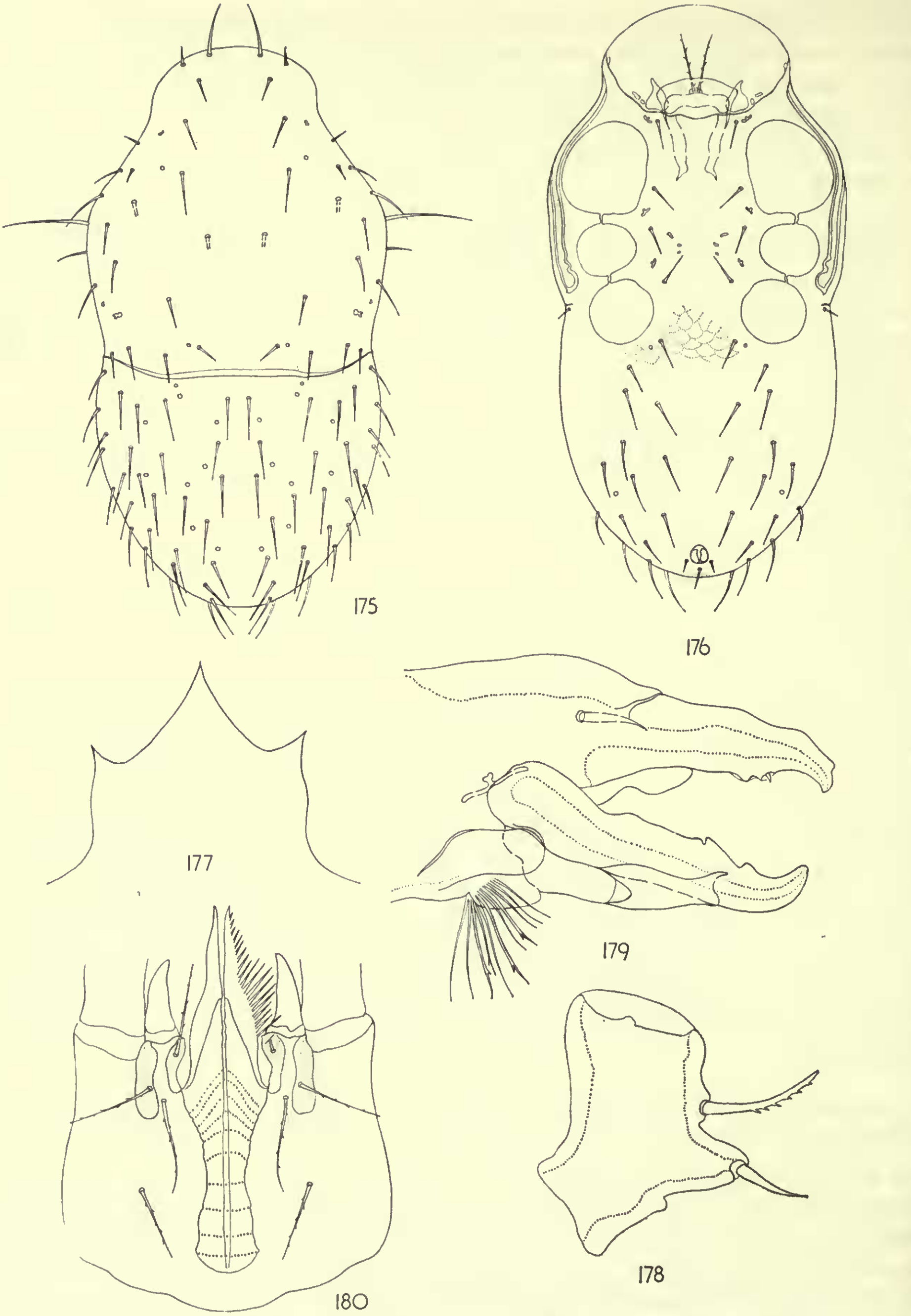
The tritosternum has a well developed basal part. The distribution of the prae-endopodal shields is shown in Text-fig. 170. The posterior margin of the sternal shield has a median incision which extends to the level of the second pair of sternal setae. The metasternal shields are free and flank the epigynial shield. A pair of endogynial horns is present. The complicated endogynial processes are figured (Text-fig. 171). The genital shield is shown in Plate 7h. The opisthogastric shield bears ten pairs of setae (excepting three setae associated with the anus). The position of the stigma and the extension of the peritreme are similar to that in the male.

The tectum is three-pronged (Text-fig. 172). The palp is basically similar to that in the male. The dentition of the chelicera is shown in Text-fig. 173. The ventral groove of the gnathosoma has ten transverse rows of denticles (Text-fig. 174).

The tibia, tarsus and prae-tarsus of leg I are 121–145μ, 170–191μ and 8–17μ long, respectively.

Distribution and habitat. The male of this species has previously been recorded only from Ireland (Halbert, 1915).

I have examined specimens from : litter and soil under evergreen trees (St. Agnes, Isles of Scilly, Cornwall, K. H. Hyatt, 5.iv.1957). In leaf mould (Rye, Houghton Green, Sussex, J. T. Salmon, 19.v.1951). Rotten wood (Blurridge Farm, Ridge Hill, Combe Martin, Devonshire, M. E. Bacchus, 12.iii.1957). *Salix* sp. litter (British Museum (Nat. Hist.), London, S. K. Bhattacharyya, 5.iii.1962). Rotten reeds (Colletts Bridge, Norfolk, P. N. Lawrence). Litter under thick evergreen hedge (St. Agnes, Isles of Scilly, Cornwall, K. H. Hyatt, 29.iii.1957). Pine litter (Clyne Park, Swansea, S. K. Bhattacharyya, 4.i.1961). Moss humus



FIGS. 175–180. *Pergamasus* (*Paragamasus*) *femoratus* sp. nov., male.
Fig. 175 dorsum of idiosoma. Fig. 176 venter. Fig. 177 tectum. Fig. 178 trochanter of pedipalp. Fig. 179 chelicera. Fig. 180 venter of gnathosoma.

and humus in small wood (Swansea University, Swansea, P. N. Lawrence, 26.iii.1962). Moss on trees and humus (Hen Parc Wood, Killay, nr. River Clyne, Swansea, P. N. Lawrence, 24.iii.1962). Oak and beech litter (Singleton Park, Swansea, S. K. Bhattacharyya, 3.i.1961). Under pines and rhododendrons (Parknasilla, Co. Kerry, Ireland, Miss T. Clay, 27.i.1953).

Pergamasus (Paragamasus) femoratus sp. nov.

MALE. The dorsal shield (854µ long × 440µ wide) is moderately sclerotized and provided with a transverse suture (Text-fig. 175). The anterior dorsal shield has twenty-one pairs of setae and the posterior dorsal shield about twenty-six pairs.

Ventrally, the tritosternal base and the proximal part of the pilose laciniae are covered by the genital lamina. The distribution of the prae-endopodal shields and the setation of the opisthogastral shield are shown in Text-fig. 176. The stigma is situated between coxae III and IV with the extension of the peritreme to coxa I.

The tectum is three-pointed (Text-fig. 177). The palpal trochanter is shown in Text-fig. 178. The femur and genu is with one comb-like and two spatulate setae respectively. The characteristic features of the chelicera are shown in Text-fig. 179. The corniculus, hypostomal process and rows of deutosternal denticles are figured (Text-fig. 180).

The tibia, tarsus and prae-tarsus of leg I are 145µ, 200–204µ and 41µ long, respectively. The femur, genu and tibia of leg II are armed with variously shaped processes (Plate 4a). The femur is characterized by the presence of a tubular spur near the proximal end of the segment, thus the name *femoratus*. The trochanter of leg IV lacks a tubercle.

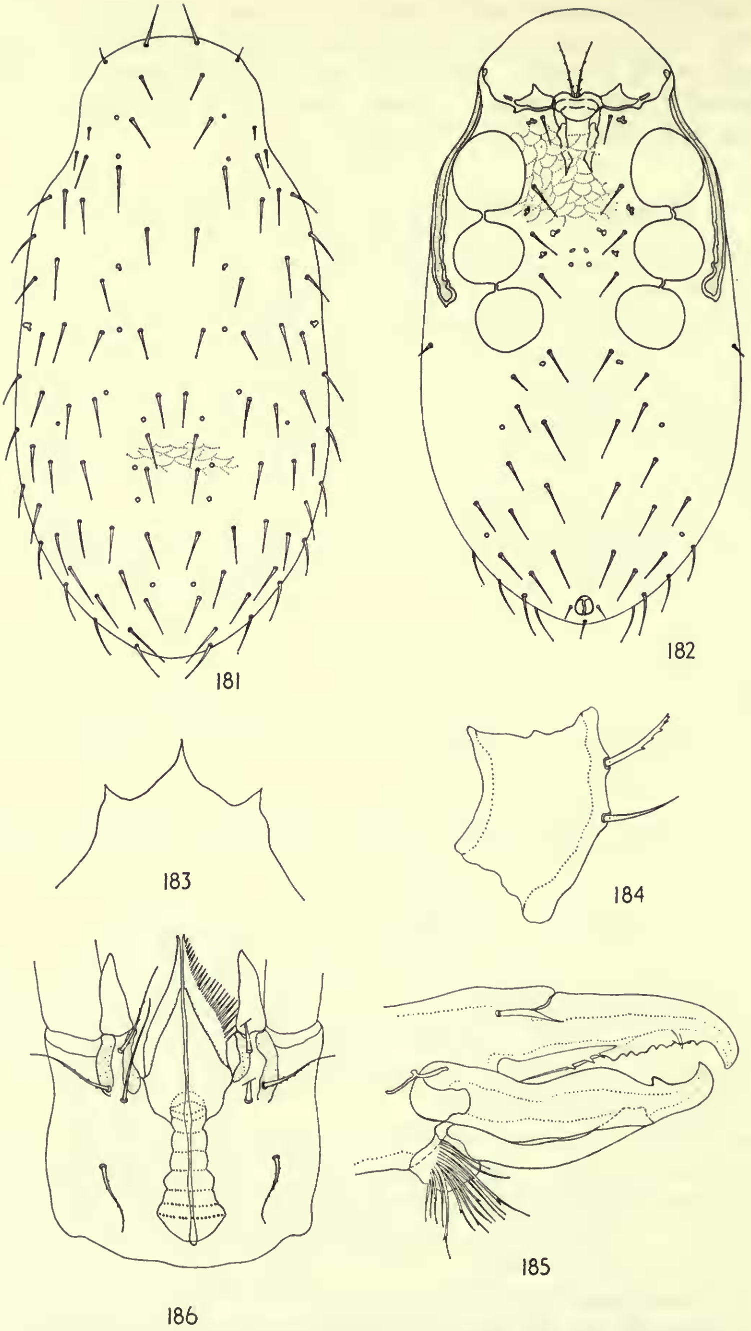
HABITAT. I have examined a single male (Holotype 1963.2.7.12) from mosses on rocks (Ballyporty Loughs, Co. Clare, Ireland, Coll. P. N. Lawrence, 12.vii.1960).

Pergamasus (Paragamasus) integer sp. nov.

MALE. This species is reddish-brown in colour, well sclerotized and regionally reticulated. The dorsal shield (747µ long × 389µ wide) has no transverse suture (Text-fig. 181). It usually bears forty-six pairs of setae of which twenty pairs are situated on the anterior half of the dorsal shield. The number of setae varies on the posterior half of the dorsal shield.

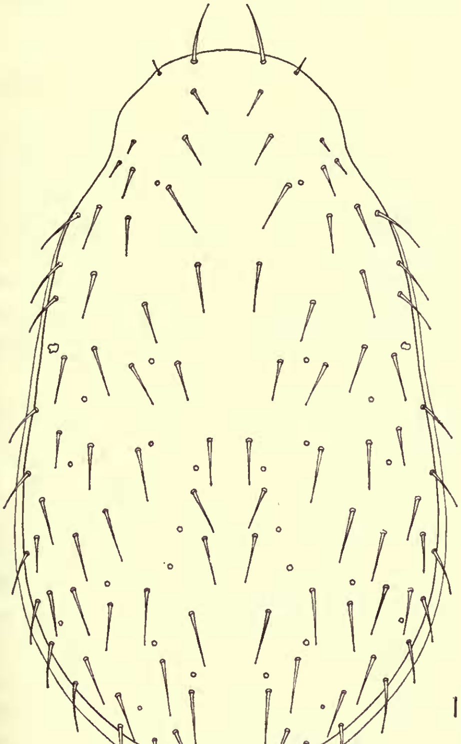
The tritosternum has a pair of pilose laciniae and its base is hidden by the genital sclerite. The distribution of the prae-endopodal shields is shown in Text-fig. 182. The setation of the opisthogastral shield is as figured. The stigma is situated between coxae III and IV ; the peritreme extends to coxa I. A pair of post-stigmatal setae, one on each side, is present.

The tectum is as figured with three prongs, of which the median is much longer and broader based (Text-fig. 183). The palpal trochanter is shown in Text-fig. 184 ; a comb-like seta is present on the femur and the genu carries two spatulate setae. The fixed digit of the chelicera has a row of closely-set teeth and a simple



FIGS. 181–186. *Pergamasus* (*Paragamasus*) *integer* sp. nov., male.
Fig. 181 dorsum of idiosoma. Fig. 182 venter. Fig. 183 tectum. Fig. 184 trochanter of pedipalp. Fig. 185 chelicera. Fig. 186 venter of gnathosoma.

dorsal seta. The movable digit is unidentate and shorter than the fixed digit (Text-fig. 185). The spermadactyl is normal. The corniculus is stalked. The entire lateral margins of the hypostomal processes are fringed. The deutosternal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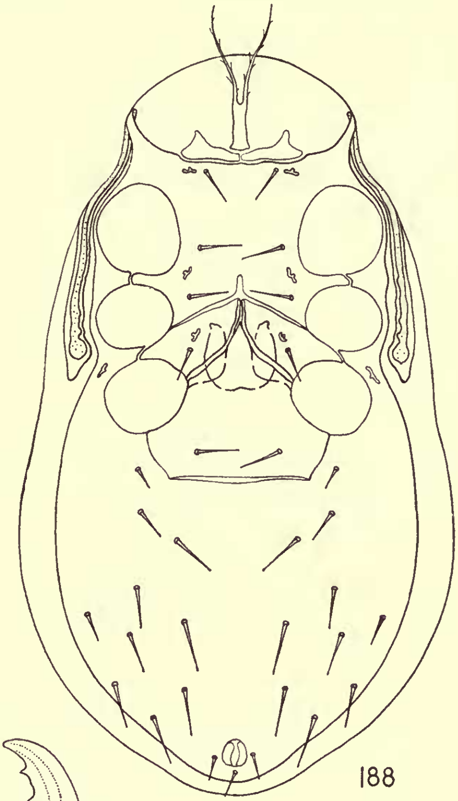
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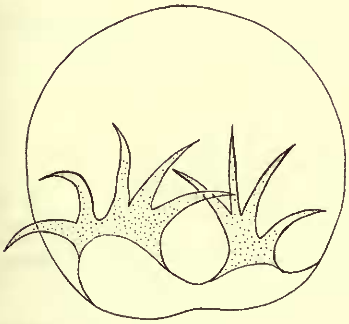
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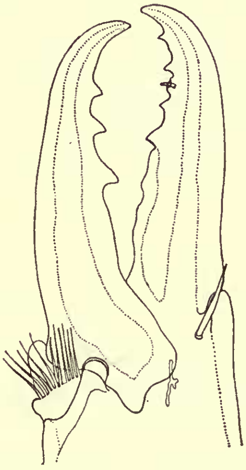
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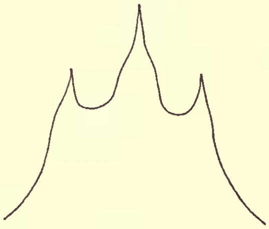
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FIGS. 187–191. *Pergamasus* (*Paragamasus*) *integer* sp. nov., female.
Fig. 187 dorsum of idiosoma. Fig. 188 venter. Fig. 189 endogynial process. Fig. 190 tectum. Fig. 191 chelicera.

denticles are arranged in ten transverse rows (Text-fig. 186). The hypostome bears the usual four pairs of setae of which three pairs are distinctly pilose.

The tibia, tarsus and prae-tarsus of leg I are 116–121μ, 183–187μ and 17μ long, respectively. The distinctive features of leg II are delineated in Plate 4b. The trochanter of leg IV is as drawn simple.

Female. The dorsal shield (889–967μ long × 500–565μ wide) is well sclerotized and its setation shown in Text-fig. 187.

Ventrally, the tritosternum has an elongated basal part and a pair of pilose laciniae. A pair of large prae-endopodal shields is present (Text-fig. 188). The metasternal shields are free. The endogynium has a pair of horns. The endogynial process is shown in Text-fig. 189. The genital shield is shown in Plate 7i. The opisthogastral shield bears ten pairs of setae (excepting three setae associated with the anus). The stigma lies between coxae III and IV ; and the peritreme extends to coxa I. The peritrematal shield runs for a short distance as a post-stigmatal prolongation.

The tectum is three-pronged, the median prong being in advance of the lateral ones (Text-fig. 190). The pedipalp essentially resembles that of the male. The chelicera is as figured (Text-fig. 191).

The tibia, tarsus and prae-tarsus of leg I are 125–129μ, 208–215μ and 17–21μ long respectively. The trochanter of leg IV is without a special prominence.

Habitat. I have examined two males and two females from moss on trees and humus (Hen Parc Wood, Killay nr. River Clyne, nr. Swansea, P. N. Lawrence, 24.iii.1962).

One female in leaf mould (Boltons Wood, Boltons Abbey, North Riding, Yorkshire, J. T. Salmon, 24.vi.1951). Two females in oak and beech leaf mould (Grasmere, Westmorland, J. T. Salmon, 26.vi.1951). Three females in rotten wood from *Pinus* sp. in woodland belt (near St. Catherines Castle, Fowey, Cornwall, Mrs. R. E. Teagle, ii.1957). Nine females and one male in moss on wall (Tarn Hows, N. Lancashire, M. E. Bacchus, 4.xii.1954).

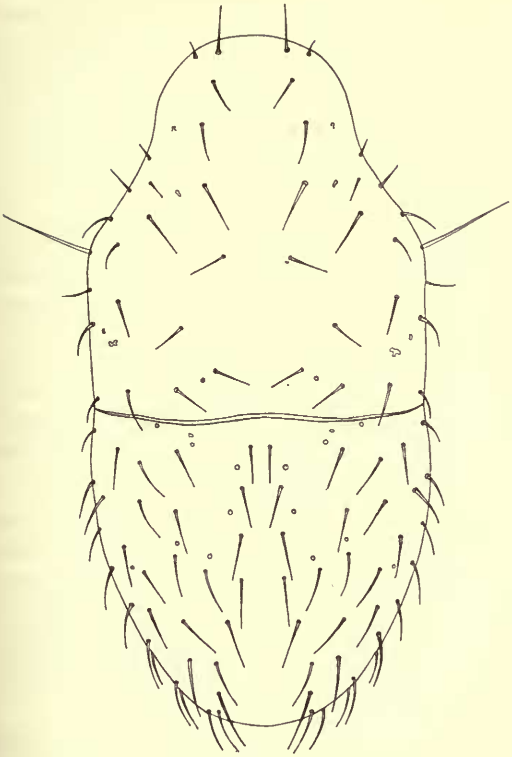
I have designated a male and female from Hen Parc Wood, Killay, nr. River Clyne, nr. Swansea, as the Holotype (1963.2.7.3) and Allotype (1963.2.7.6), respectively.

Pergamasus (Paragamasus) lapponicus Trägårdh

Pergamasus lapponicus Trägårdh, I. (1910). *Naturw. Untersuch. Sarekgeb.* **4** (4) : 408, figs. Cooreman, J. (1943). *Bull. Mus. roy. Hist. nat. Belg.*, **19**, 63 : 5, figs. ; Schweizer, J. (1949). *Ergebn. wissens. Untersuch. Schweiz. Nationalparkes* (n.s.) **2** : 28, figs ; Schweizer, J. (1961). *Denks. schweiz. naturf. Ges.* **84** : 56, figs.

Male. The dorsal shield (797–831μ long × 400–417μ wide) has a transverse suture (Text-fig. 192) and is regionally reticulated. The anterior dorsal shield bears twenty-one pairs of setae and the posterior dorsal shield about twenty-eight pairs.

The tritosternum has a pair of pilose laciniae but its base is completely hidden by the genital sclerite. The shape of the genital lamina is shown in Text-fig. 193.



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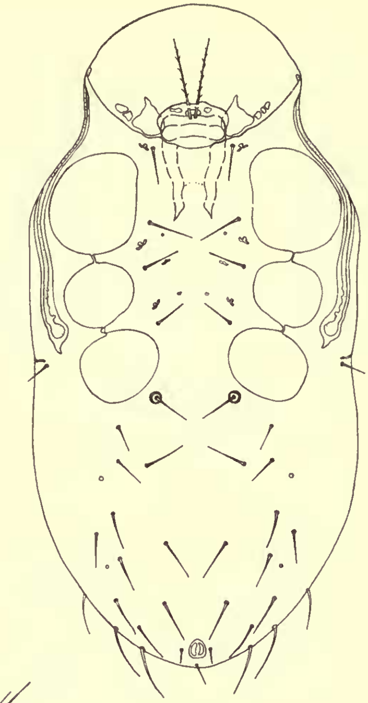

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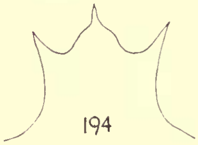

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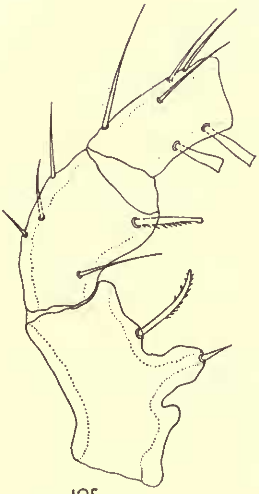

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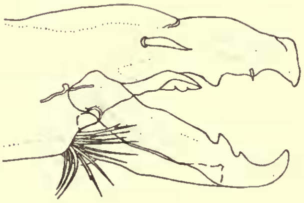

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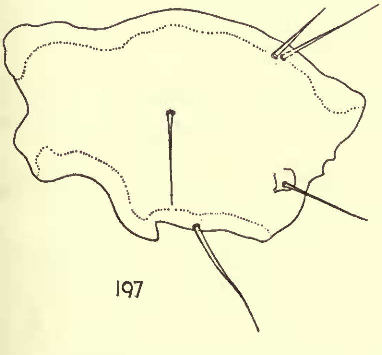

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FIGS. 192–197. *Pergamasus* (*Paragamasus*) *lapponicus* Trägårdh, male. Fig. 192 dorsum of idiosoma. Fig. 193 venter. Fig. 194 tectum. Fig. 195 trochanter, femur and genu of pedipalp. Fig. 196 chelicera. Fig. 197 trochanter of leg IV.

The venter has a remarkable rounded, scaly, seta-bearing structure near coxa IV. The number of setae on the opisthogastric shield is shown in Text-fig. 193. The stigma is situated between the coxae III and IV ; the peritreme extends to coxa I. There is a post-stigmatal seta.

The tectum is three-pointed (Text-fig. 194). The palpal trochanter has a modified nipple-like setae-bearing process, at the base of which is a small protuberance ; a comb-like seta is present on the femur whilst the genu has two spatulate setae (Text-fig. 195). The distinctive shape of the fixed digit of the chelicera is shown in Text-fig. 196. The movable digit is bidentate, and the spermadactyl is normal. The corniculus is distinctly stalked. The entire lateral (outer) margins of the hypostomal processes are fringed.

The tarsus (187–208μ) of leg I is longer than the tibia (141–145μ) ; the prae-tarsus is 17–21μ long. The trochanter (Plate 4c) of leg II has a well developed spur ; the femur, genu and tibia are spurred (Plate 4d). The main process of the crassate femur is falcate. The armature of the trochanter of leg IV is figured (Text-fig. 197).

FEMALE. The dorsal shield (764–797μ long × 400–467μ wide) is more or less oval and yellow in colour and regionally reticulated. The anterior shield has only twenty-one pairs of setae and the posterior half bears about twenty-nine pairs (Text-fig. 198). The length of the dorsal setae vary considerably.

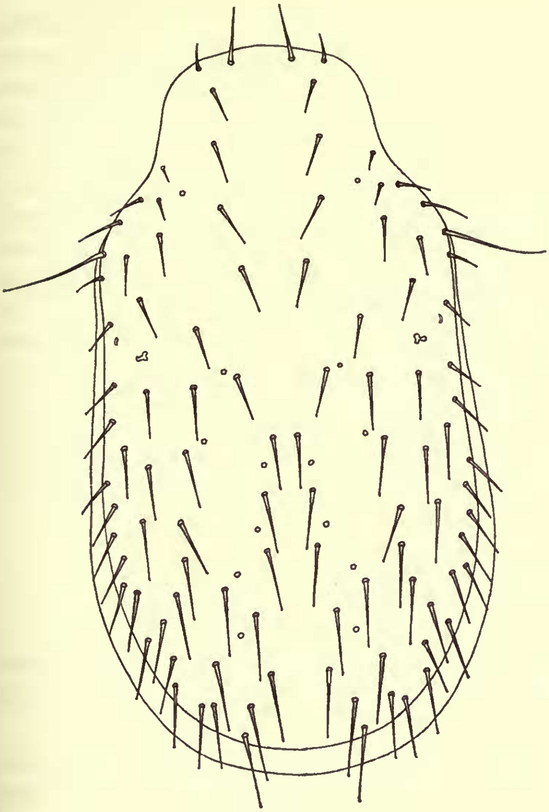
Ventrally, the tritosternum has a pair of well developed pilose laciniae. The distribution of the prae-endopodal shields is shown in Text-fig. 199. The interscutal membrane in between the anterior margin of the sternal shield and the prae-endopodal shield is striated. The metasternal shield is free. There is a pair of endogynial horns. The genital shields are shown in Plate 8h and i. The opisthogastral shield is with ten pairs of setae. The stigma is situated between coxae III and IV ; and the peritreme reaches to the level of coxa I.

The tectum is basically three pronged but may be variable (Text-fig. 200). The fixed digit of the chelicera has four teeth but the movable digit is tridentate (Text-fig. 201).

The tibia, tarsus and prae-tarsus of leg I are 137–141μ, 196–200μ and 16–18μ long, respectively. The trochanter of leg IV is figured (Text-fig. 202).

DISTRIBUTION AND HABITAT. This species is known from Swedish Lapland (Trägårdh, 1910), Belgium (Cooreman, 1943), Germany and Switzerland (Schweizer, 1949, 1961).

I have examined material from leaf mould (Epping Forest, Essex, J. T. Salmon, 27.v.1951). *Sphagnum*, etc. (Cock Hill, Yorkshire, J. T. Salmon, 21.vii.1951). In marsh debris (Surlingham, Norfolk, J. T. Salmon, 12.v.1951). In leaf mould (Savernake Forest, Berkshire, J. T. Salmon, 26.ix.1951). Litter and humus under pines and holly (near Duddleswell, Ashdown Forest, Sussex, K. H. Hyatt, 10.ix.1956). In leaf mould (Forest of Dean, Gloucestershire, J. T. Salmon, 27.ix.1951). From litter (Stratton Strawless, near Aylsham, Norwich, Norfolk, J. T. Salmon, 13.v.1951). In moss of wall (Tarn Hows, North Lancashire, M. E. Bacchus, 4.xii.1954). In moss (Grassington, Grass Woods, North Riding, Yorkshire, J. T. Salmon, 24.vi.1951). In *Sphagnum* (Virginia Water, Surrey, A. H. G. Alston, 18.xii.1951). *Sphagnum* (Ascot, Berkshire, A. H. G. Alston, 8.xii.1957). Moles' (*Talpa europaea*) nest, near pasture (Godstone, Surrey, Prof. P. A. Larkin, 4.xi.1962. Per C. Elton). Moss from trees and wall (Pont Hill, Cornwall, Mrs. R. E. Teagle, 24.ii.1957). Litter under yew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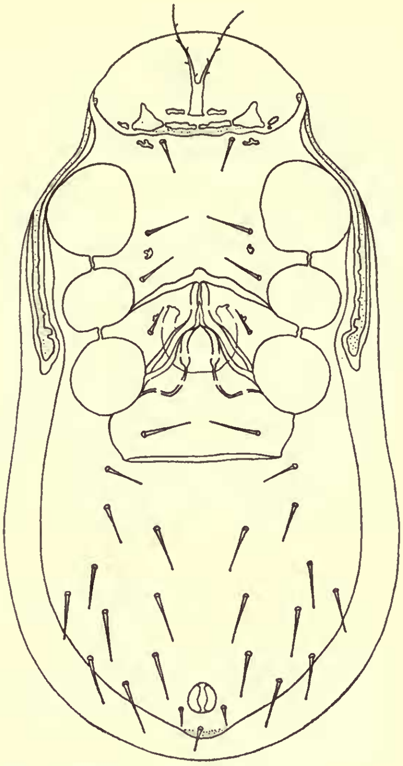
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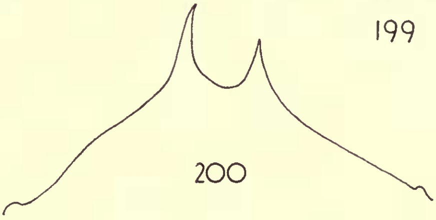
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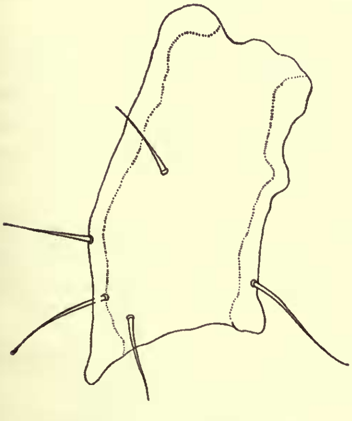
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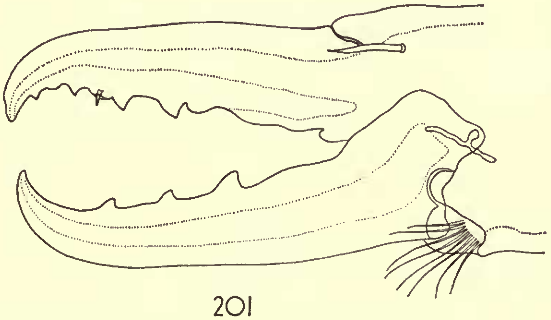
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FIGS. 198–202. *Pergamasus* (*Paragamasus*) *lapponicus* Trägårdh, female.
Fig. 198 dorsum of idiosoma. Fig. 199 venter. Fig. 200 tectum. Fig. 201 chelicera.
Fig. 202 trochanter of leg IV.

(summit of Box Hill, Surrey, A. H. G. Alston, 15.i.1956). Hornbeam humus (Bookham Common, Surrey, Mrs. R. E. Teagle, xi.1956). Holly humus (near Groombridge, Sussex, P. N. Lawrence, 3.iii.1957). In oak and beech leaf mould (Grasmere, Westmorland, J. T. Salmon, 26.vi.1951). Heath and birch (St. Faith's Common, Horsford, Norwich, Norfolk, J. T. Salmon, 13.v.1951). In leaf mould (Leith Hill, Surrey, J. T. Salmon, 16.vi.1951). In leaf mould (Richmond Park, Surrey, J. T. Salmon, 19.iii.1951). Moss from crevices in rocks (near Force Forge, Westmorland, M. E. Bacchus, 2.xii.1954). In leaf mould (Boltons Wood, Boltons Abbey, North Riding, Yorkshire, J. T. Salmon, 24.v.1951). In leaf mould (Burnham Beeches, Bucks., J. T. Salmon, 3.vi.1951). Oak humus (Gwydyr Forest, North Wales, P. N. Lawrence, 22.x.1961). Moss on boulder (Llandudno, North Wales, P. N. Lawrence, 12.xi.1961). Rhododendron humus (Swansea University, Swansea, P. N. Lawrence, 26.iii.1962). Turf among bracken (Clyne Common, Swansea, P. N. Lawrence, 29.iii.1962). Bracken litter (Bishopston Common, Swansea, S. K. Bhattacharyya, 4.i.1961). Floor of scotch fir wood (Aviemore, Inverness, J. T. Salmon, 7.vii.1951). In moss (Tarbet, Crianlarich, Loch Lomond, Dunbarton, J. T. Salmon, 3.vii.1951).

Pergamasus* (*Paragamasus*) *leruthi Cooreman

Pergamasus leruthi Cooreman, J. (1951). *Bull Mus. Hist. nat. Belge.* **27**, 42 : 5, figs.

MALE. The dorsal shield (732μ long × 382μ wide) is without a median transverse suture and yellow in colour. The distribution of setae on the dorsal shield is shown in Text-fig. 203.

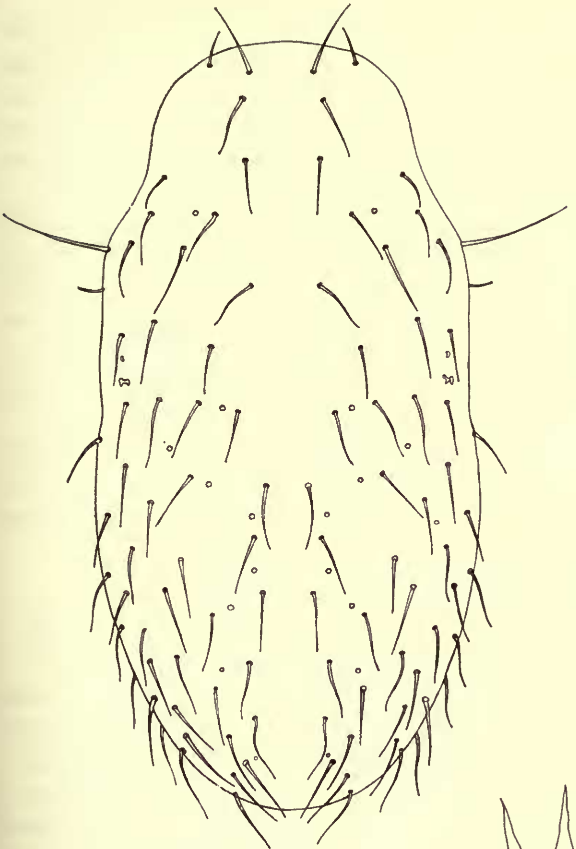
The tritosternum is provided with a pair of pilose laciniae. The distribution of the prae-endopodal shields is shown in Text-fig. 204. The genital lamina is not produced into a median spine. There is a pair of undulating fissures which extend downward from the anterior margin of the sternal shield (Text-fig. 204). The stigma is situated between coxae III and IV ; and the peritreme extends to coxa I. The post-stigmatal extension of the peritrematal shield reaches coxa IV.

The tectum is three-pronged (Text-fig. 205). The palpal trochanter is without a prominence ; the femur and genu are provided with a comb-like and two spatulate setae, respectively. The terminal end of the fixed digit is slightly blunt and provided with a simple seta ; the movable digit is unidentate, with a spermadactyl process (Text-fig. 206). The corniculus is stalked.

The tibia, tarsus and prae-tarsus of leg I are 126–166μ, 187–208μ and 17–21μ long, respectively. Leg II (Plate 4e) is remarkable for the peculiar shape of the spurs present on the genu and tibia. The trochanter of leg IV is as shown in Text-fig. 207.

FEMALE. The dorsal shield (882μ long × 457μ wide) is sclerotized. The distribution and relative lengths of the dorsal setae are shown in Text-fig. 208.

The tritosternum has an elongated basal part and a pair of pilose laciniae. The distribution of the prae-endopodal shields is shown in Text-fig. 209. The metasternal shields are free. The endogynium has a pair of horns. The endogynial process is very complicated (Text-fig. 210). The opisthogastral shield bears only



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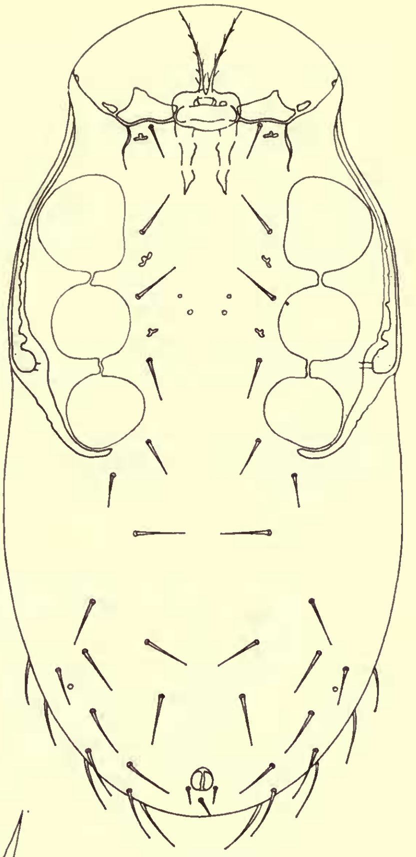

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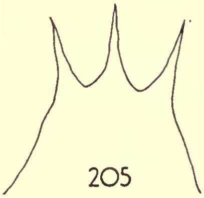

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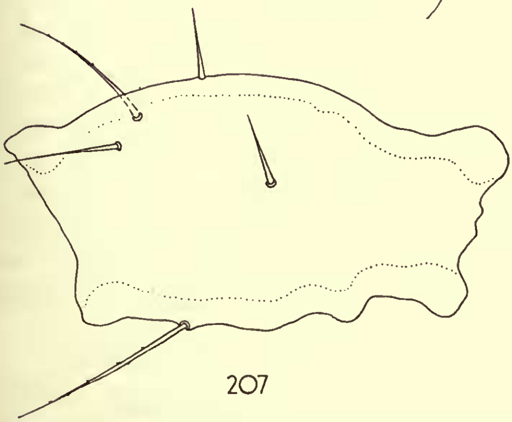

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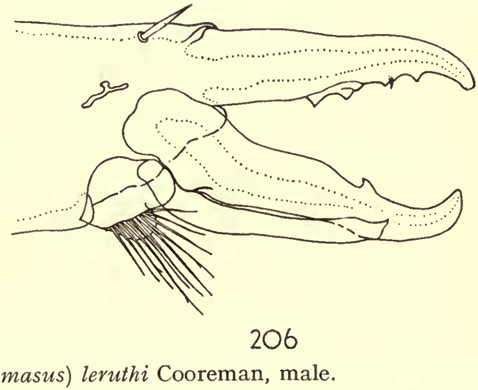

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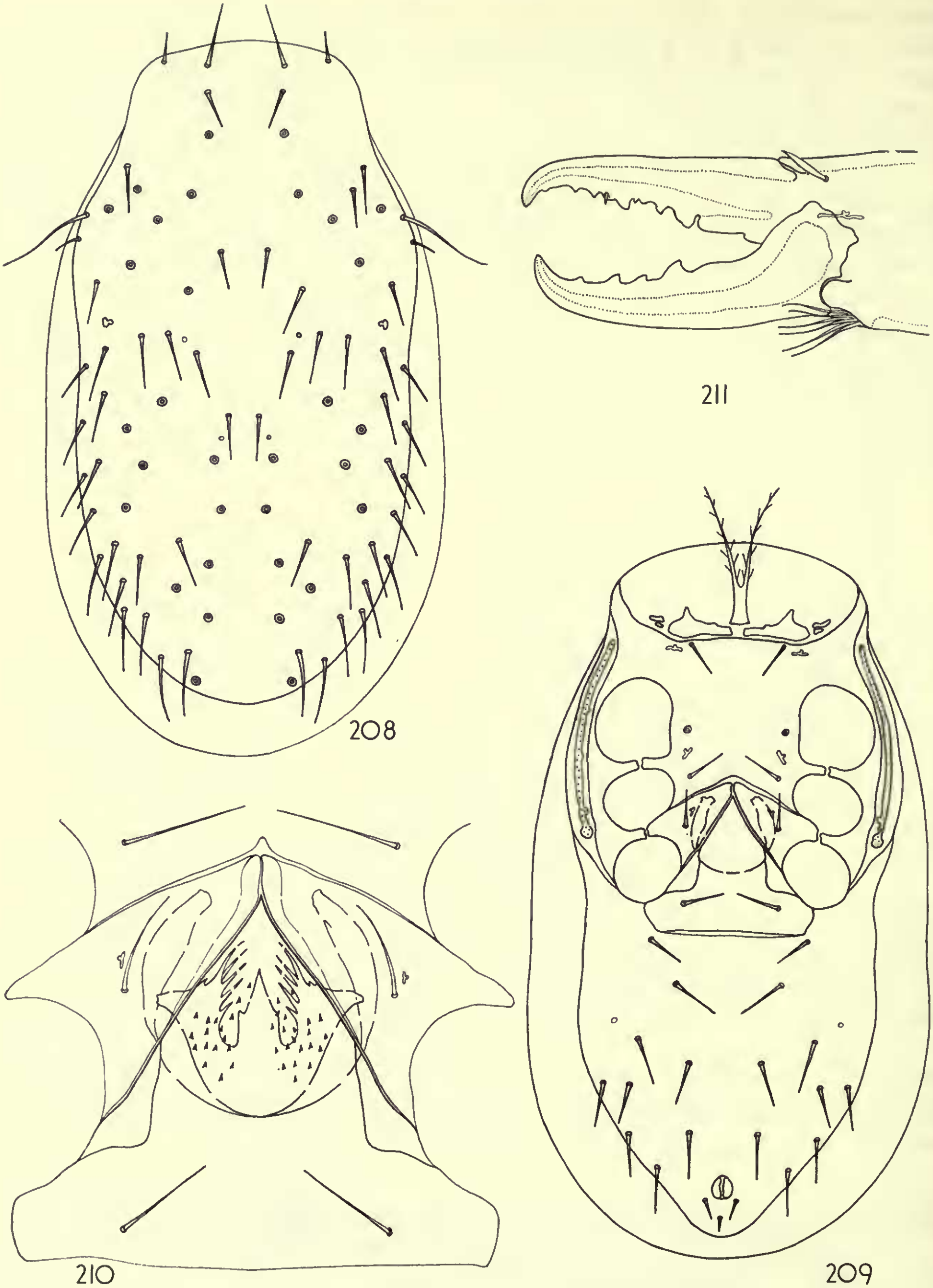
Figs. 203–207. *Pergamasus* (*Paragamasus*) *leruthi* Cooreman, male.
Fig. 203 dorsum of idiosoma. Fig. 204 venter. Fig. 205 tectum. Fig. 206 chelicera.
Fig. 207 trochanter of leg IV.



Figs. 208–211. *Pergamasus* (*Paragamasus*) *leruthi* Cooreman, female.
Fig. 208 dorsum of idiosoma. Fig. 209 venter. Fig. 210 magnified structure of the sterniti-genital region. Fig. 211 chelicera.

nine pairs of setae (excepting three setae associated with the anus). The stigma is situated between coxae III and IV ; and the extension of the peritreme is not clearly distinguishable from the damaged specimen. The entire peritrematal shield is coalesced with the ventral shield. The post-stigmatal extension of the peritrematal shield reaches to coxa IV.

The tectum is three-pronged. The pedipalp is similar to that of the male. The fixed digit of the chelicera is furnished with a row of closely-set teeth ; the movable digit is with four teeth (Text-fig. 211).

The tibia, tarsus and prae-tarsus of leg I are 158–166μ, 225–229μ and 21μ long, respectively.

DISTRIBUTION AND HABITAT. This species has been recorded from Roumania (Cooreman, 1951).

I have found only one male from Scotland, in dead leaves (Loch Lomond, between Glasgow and Tarbet, Dunbarton, J. T. Salmon, 8.vii.1951). I have examined Cooreman's specimens of both sexes. The above description and figures of the female are based on the paratype.

Pergamasus (Paragamasus) londonensis sp. nov.

MALE. Unknown.

FEMALE. The dorsal shield (474–483μ long × 267–283μ wide) is light yellow in colour and not heavily sclerotized. The anterior half of the dorsal shield bears twenty-one pairs of setae and the posterior half about twenty pairs (Text-fig. 212).

Ventrally, the tritosternum has a long basal part and a pair of pilose laciniae. The distribution of the prae-endopodal shields in relation to the tritosternum is shown in Text-fig. 213. The metasternal shields are free. The endogynial structure is comparatively simple. The genital shield is shown in Plate 7j. The opisthogastral shield is provided with only eight pairs of setae (excepting the three setae associated with the anus). The stigma is situated between coxa III and IV ; and the peritreme extends to coxa I.

The tectum is three-pronged (Text-fig. 214). The trochanter, femur and genu of the pedipalp are similar to those in *P. rothamstedensis*. The chelicera is shown in Text-fig. 215. The hypostomal processes and deutosternal denticles resemble those of the female of *P. rothamstedensis*.

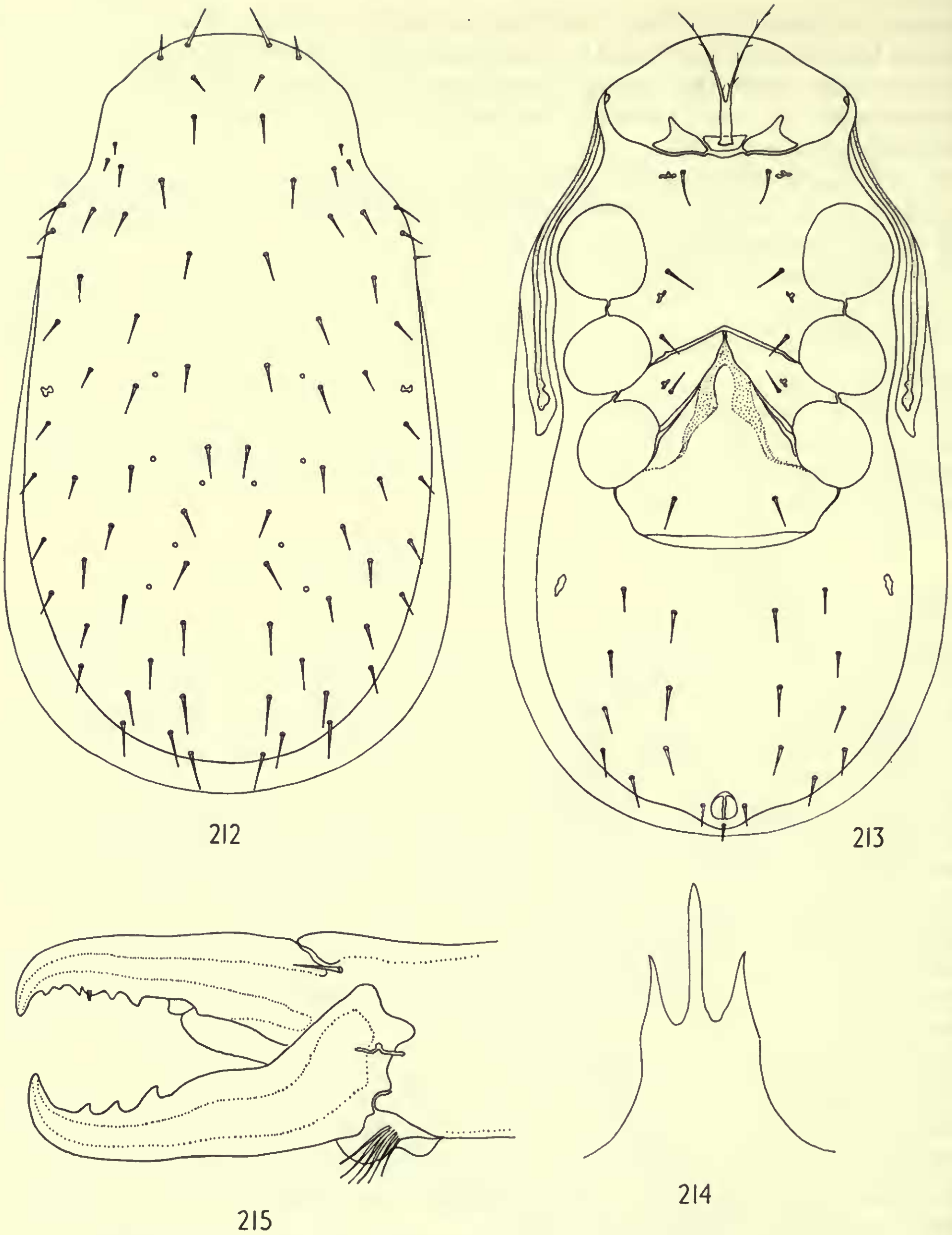
The tibia, tarsus and prae-tarsus of leg I are 70μ, 116–121μ and 8–12μ long, respectively. The trochanter of leg IV is devoid of prominences.

HABITAT. I have examined four females from *Salix* sp. litter (British Museum (Nat. Hist.), London, S. K. Bhattacharyya, 5.iii.1962) and have designated a female as the Holotype (1963.2.7.11).

Pergamasus (Paragamasus) longisetosus sp. nov.

MALE. Unknown.

FEMALE. The dorsal shield (974–1,000μ long × 632μ wide) is reddish-brown in colour and strongly sclerotized. The dorsal setae are comparatively long (some of

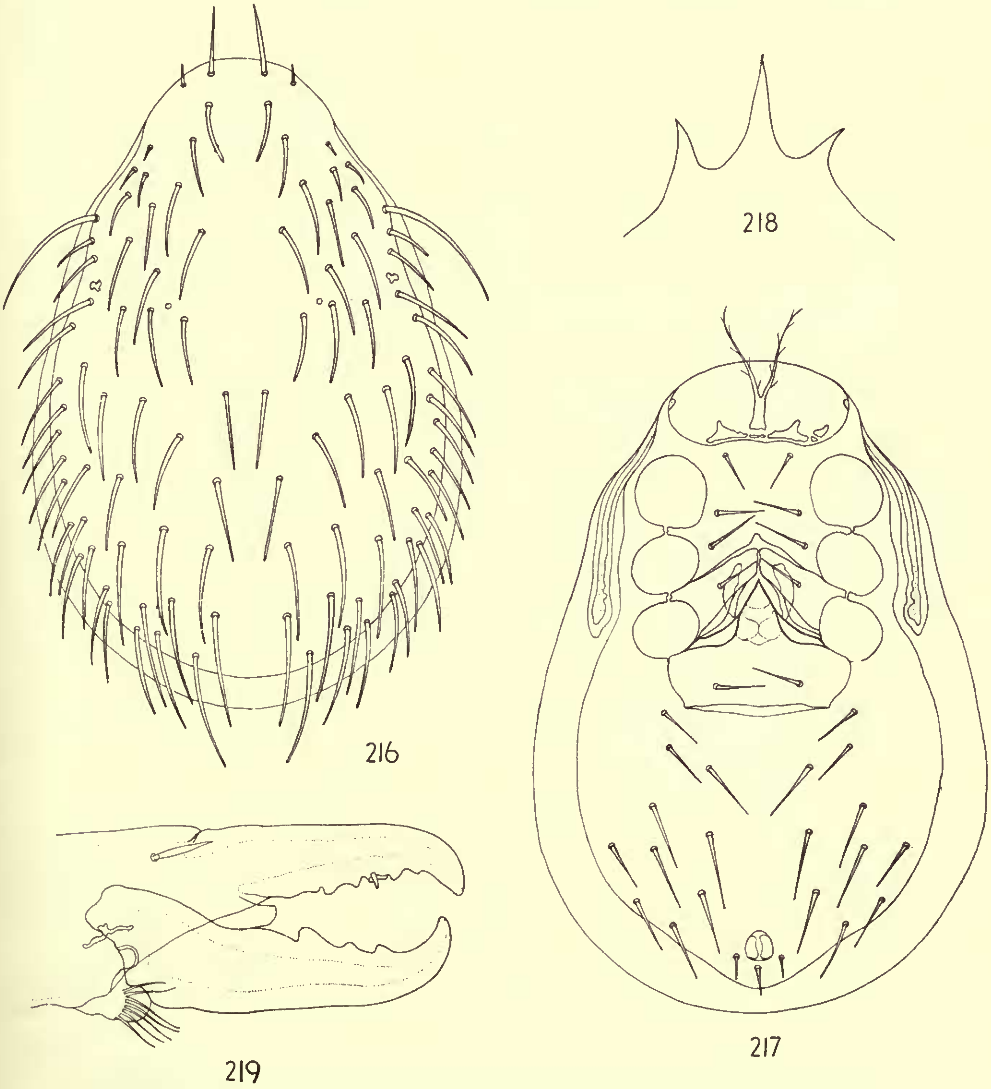


Figs. 212–215. *Pergamasus* (*Paragamasus*) *londonensis* sp. nov., female.
Fig. 212 dorsum of idiosoma. Fig. 213 venter. Fig. 214 tectum. Fig. 215 chelicera.

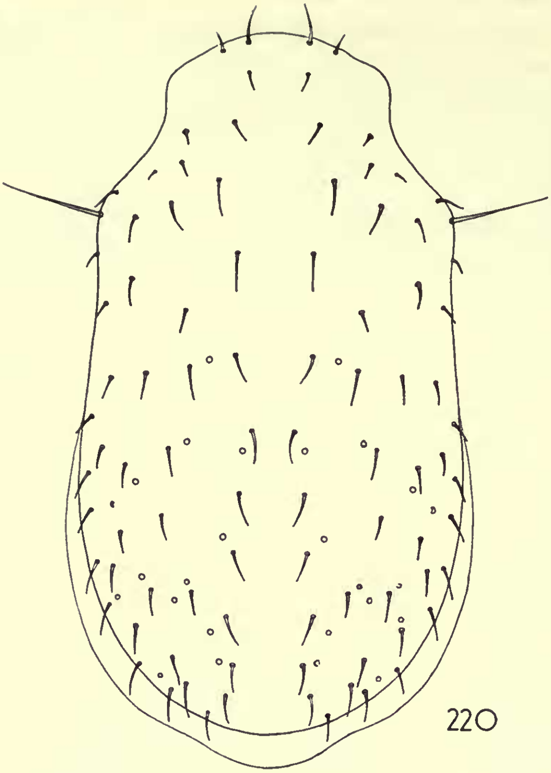
them sparsely ciliated) and stout, and their distribution is shown in Text-fig. 216. The podonotal shield has an invariable number of setae (twenty-one pairs) but the number of setae on the opisthonotal shield is about twenty-eight pairs.

Ventrally, the tritosternum has a pair of pilose laciniae. The prae-endopodal shields are present. The posterior margin of the sternal shield has a short median incision. The metasternal shields are free. The endogynium has a pair of horns and its process is comparatively simple. The setation of the opisthogastral shield is shown in Text-fig. 217. The stigma is situated between coxae III and IV ; the peritreme extends to the level of coxa I.

The tectum is three-pronged, the median tine being longer than the lateral ones (Text-fig. 218). The most distinctive features of the chaetotaxy of the pedipalp



FIGS. 216–219. *Pergamasus* (*Paragamasus*) *longisetosus* sp. nov., female.
Fig. 216 dorsum of idiosoma. Fig. 217 venter. Fig. 218 tectum. Fig. 219 chelicera.



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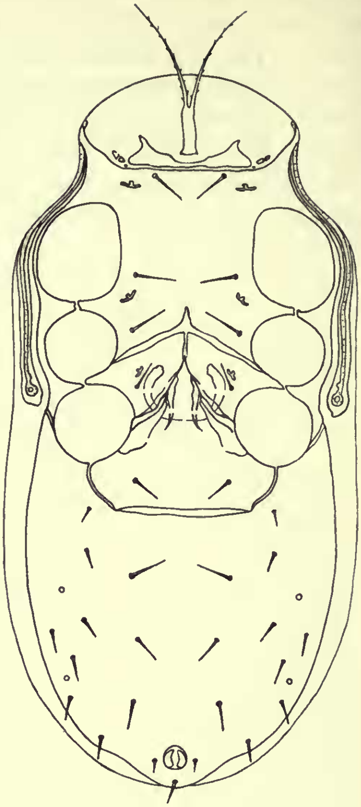

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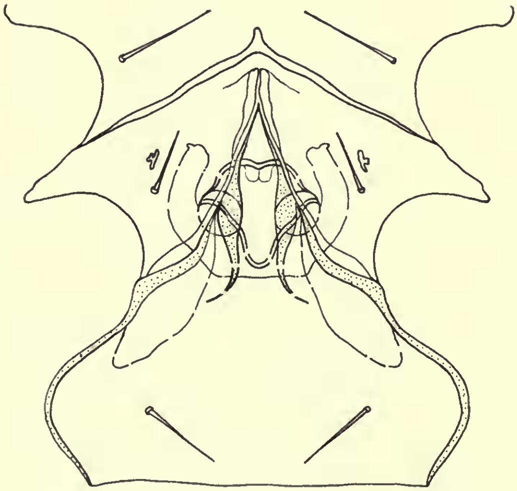

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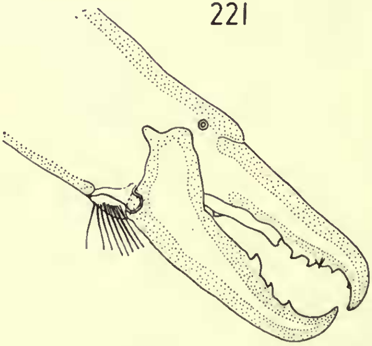

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FIGS. 220–223. *Pergamasus* (*Paragamasus*) *minimus* sp. nov., female.
Fig. 220 dorsum of idiosoma. Fig. 221 venter. Fig. 222 magnified structure of the sterniti-genital region. Fig. 223 chelicera.

are ; the comb-like seta on the femur and the two spatulate setae on the genu. The dentition of the chelicera is shown in Text-fig. 219.

The deutosternal denticles are arranged in ten transverse rows.

The tibia, tarsus and prae-tarsus of leg I are 149–154μ, 204–225μ and 18μ long respectively. The trochanter of leg IV is without any prominence.

HABITAT. One female has been obtained from inside the bark of a fallen elm tree (Harefield, Middlesex, A. H. G. Alston, 22.i.1956), and a single female from the Royal Botanic Gardens, Kew, Surrey, by John L. Gilbert (5.iii.1961).

I have designated the female from Harefield, Middlesex as the Holotype (1963.2.7.8).

Pergamasus (Paragamasus) minimus sp. nov.

MALE. Unknown.

FEMALE. The dorsal shield (500μ long × 265μ wide) is very weakly sclerotized. The dorsal setae are comparatively short (Text-fig. 220).

The tritosternum has an elongated base and a pair of well-developed pilose laciniae. The distribution of the prae-endopodal shields is delineated in Text-fig. 221. The metasternal shields are free. The endogynium has a pair of horn-like structures (Text-fig. 222). The opisthogastric shield has ten pairs of setae (excepting three setae associated with the anus). The stigma is present, between coxae III and IV ; and the peritreme extends as far as the level of coxa I.

The tectum is three-pronged. The most distinctive features of the pedipalp are ; the femur is with a comb-like and the genu with a spatulate seta, respectively. The dentition of the chelicera is shown in Text-fig. 223. Approximately half of the lateral margins of the hypostomal processes are fringed. The deutosternum of the ventral groove of the gnathosoma has nine (ten?) transverse rows of denticles.

Leg I with the tibia 77μ and tarsus 121μ long, the prae-tarsus is 8μ long. The trochanter of leg IV is tuberculated.

HABITAT. I have examined a single female (Holotype 1963 : 2.7.19) from soil and compost (Tettenhall, Stafford, Dr. D. W. Empson, 4.iii.1959).

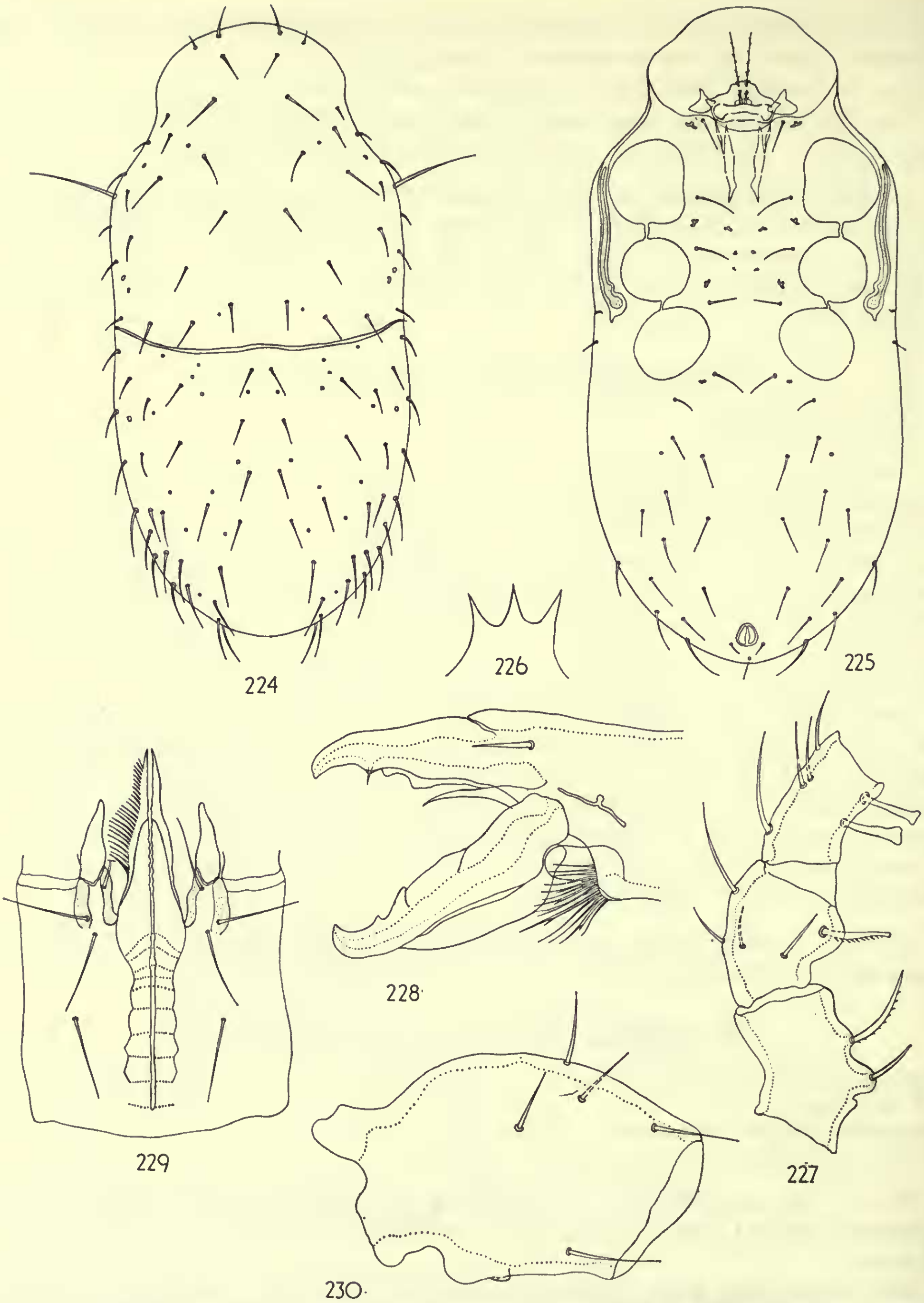
Pergamasus (Paragamasus) misellus Berlese

Gamasus (*Pergamasus*) *misellus* Berlese, A. (1904). *Redia* **1** : 237 ; Berlese, A. (1906). *Redia* **3** : 207, figs.

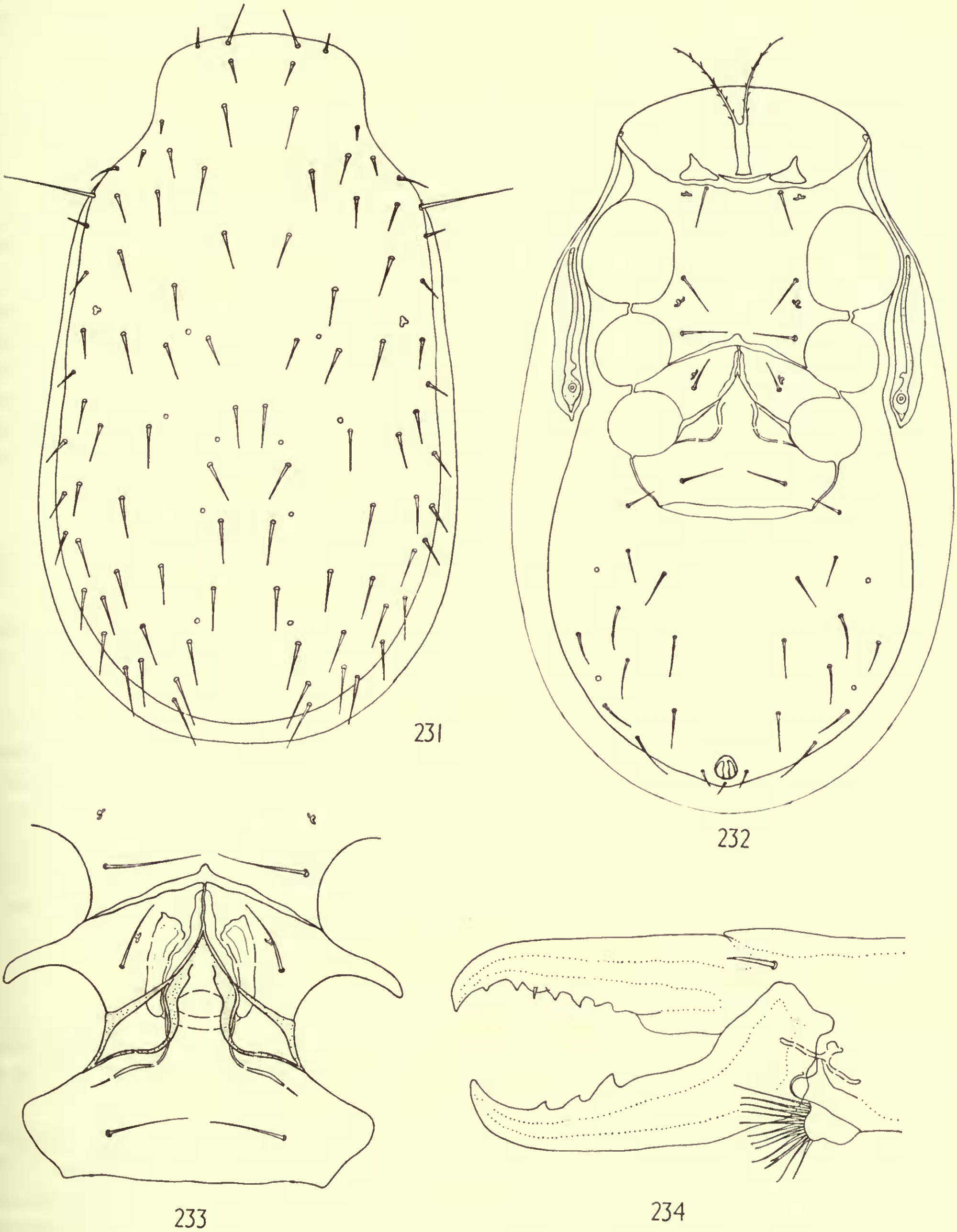
Pergamasus misellus : Schweizer, J. (1961). *Denks. schweiz. naturf. Ges.* **84** : 49, figs. ; Karg, W. (1962). *Mitt. Zool. Mus. Berlin* **38** : 77, figs.

MALE. The dorsal shield is 515–548μ long and 283μ wide and is provided with a transverse suture (Text-fig. 224). The anterior dorsal shield bears twenty-one pairs of setae.

The tritosternum, prae-endopodal shields and the shape of the genital lamina is shown in Text-fig. 225. The stigma is situated between coxae III and IV ; and the peritreme extends to coxa II. A pair of post-stigmatal setae is present.



Figs. 224–230. *Pergamasus* (*Paragamasus*) *misellus* Berlese, male.
Fig. 224 dorsum of idiosoma. Fig. 225 venter. Fig. 226 tectum. Fig. 227 trochanter, femur and genu of pedipalp. Fig. 228 chelicera. Fig. 229 venter of gnathosoma. Fig. 230 trochanter of leg IV.



FIGS. 231–234. *Pergamasus* (*Paragamasus*) *misellus* Berlese, female.
Fig. 231 dorsum of idiosoma. Fig. 232 venter. Fig. 233 magnified structure of the sterniti-genital region. Fig. 234 chelicera.

The tectum is three-pronged (Text-fig. 226). The distinctive features of the pedipalp are shown in Text-fig. 227. The chelicera is as in Text-fig. 228. The form of the hypostomal processes and rows of deutosternal denticles are shown in Text-fig. 229.

The tarsus of leg I (129–133μ) is longer than the tibia (78–83μ) ; the prae-tarsus being 8μ long. The femur, genu and tibia are spurred (Plate 5a). A tubercle is present on the trochanter of leg IV (Text-fig. 230).

FEMALE. The dorsal shield measures 565–582μ long and 332–339μ wide. The anterior region of the dorsal shield has twenty-one pairs of setae and the posterior region about twenty-five pairs (Text-fig. 231).

Ventrally, the tritosternum has an elongated basal part and a pair of pilose laciniae. The prae-endopodal shields are distributed as in Text-fig. 232. The metasternal shields are free ; and a pair of endogynial horns is present. The enlarged view of the genital region is shown in Text-fig. 233. The genital shield is shown in Plate 8a. There are ten pairs of opisthogastral setae (excepting a pair of paranal and a postanal seta). The position of the stigma and the extension of the peritreme are similar to the male.

The tectum has three prongs. The chelicera is delineated in Text-fig. 234.

The tibia, tarsus and prae-tarsus of leg I are 74μ, 125μ, and 8μ long respectively. The trochanter of leg IV has a tubercle.

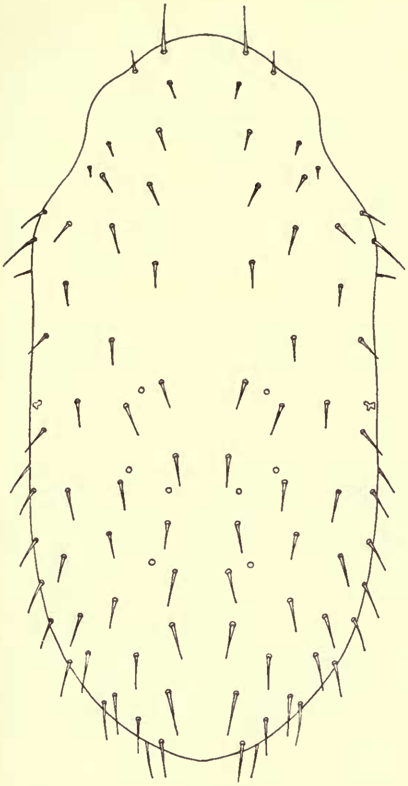
DISTRIBUTION AND HABITAT. *P. misellus* has been previously recorded from Italy (Berlese, 1904, 1906), Switzerland (Schweizer, 1961) and Germany (Karg, 1962).

I have examined specimens from litter under *Cupressus* sp. (Rothamsted Lodge, Rothamsted Experimental Station, Harpenden, Hertfordshire, G. Owen Evans and E. Browning, 18.iii.1957). *Salix* sp. litter, British Museum (Nat. Hist.), London, S. K. Bhattacharyya, 5.iii.1962). Turf among bracken (Clyne Common, Swansea, P. N. Lawrence, 29.iii.1962). Humus in small wood (Swansea University, P. N. Lawrence, 26.iii.1962). Pine litter (Clyne Park, Swansea, S. K. Bhattacharyya, 4.i.1961). Bracken litter (Bishopston Common, Swansea, S. K. Bhattacharyya, 4.i.1961).

Pergamasus (Paragamasus) nathistmus sp. nov.

MALE. The dorsal shield (374μ long × 183μ wide) is weakly sclerotized, regionally reticulated and somewhat oval in shape. The dorsum is devoid of a transverse suture (Text-fig. 235).

Ventrally, there are two large prae-endopodal shields flanking the genital sclerite and partly covered by the genital lamina. The genital lamina has essentially the same shape as in *P. rothamstedensis* sp.n. The basal part of the tritosternum is completely hidden by the genital sclerite. The chaetotaxy of the venter is shown in Text-fig. 236. The stigma is situated between coxae III and IV ; the peritreme extends to coxa I. The post-stigmatal extension of the peritrematal shield is not clearly discernible.



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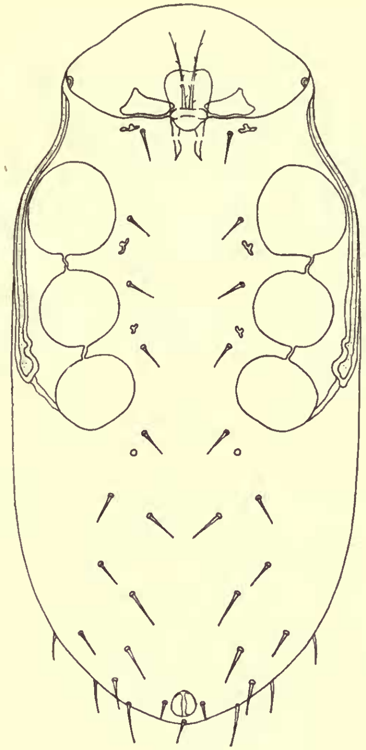

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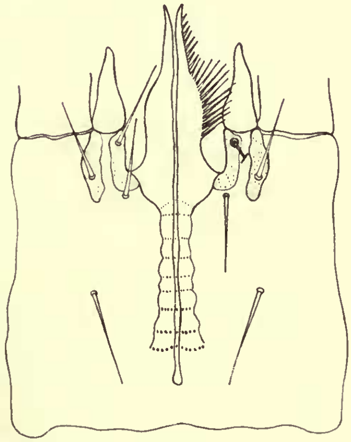

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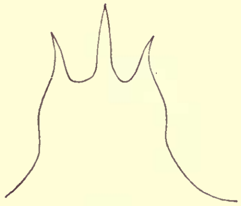

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FIGS. 235–238. *Pergamasus* (*Paragamasus*) *nathistmus* sp. nov., male. Fig. 235 dorsum of idiosoma. Fig. 236 venter. Fig. 237 tectum. Fig. 238 venter of gnathosoma.

The tectum is three-pronged, the centre prong being longer than the lateral ones (Text-fig. 237). The palp trochanter has no tubercle. The femur has a comb-like seta, and the genu two spatulate setae. Owing to the small size and weakly sclerotized body of the single specimen it did not seem advisable to risk the dissection of the chelicera, so that its dentition is not included in the description. The gnathosoma is shown in Text-fig. 238.

The tibia, tarsus and prae-tarsus of leg I are 60–62μ, 95μ and 8–10μ respectively. Leg II is very weakly spurred (Plate 5b). The femur is not crassate and its main spur is as long as the tibial process.

Habitat. I have examined a single male (Holotype 1963 : 2.7.9) from *Salix* sp. litter, British Museum (Natural History), London (Coll. S. K. Bhattacharyya, 14.iii.1962).

Pergamasus (Paragamasus) parrunciger sp. nov.

Male. The dorsal shield (797μ long × 374–382μ wide) is rather weakly sclerotized and provided with a transverse suture (Text-fig. 239). The anterior dorsal shield bears twenty-one pairs of setae and is regionally reticulated. The posterior dorsal shield has about twenty-eight pairs of setae.

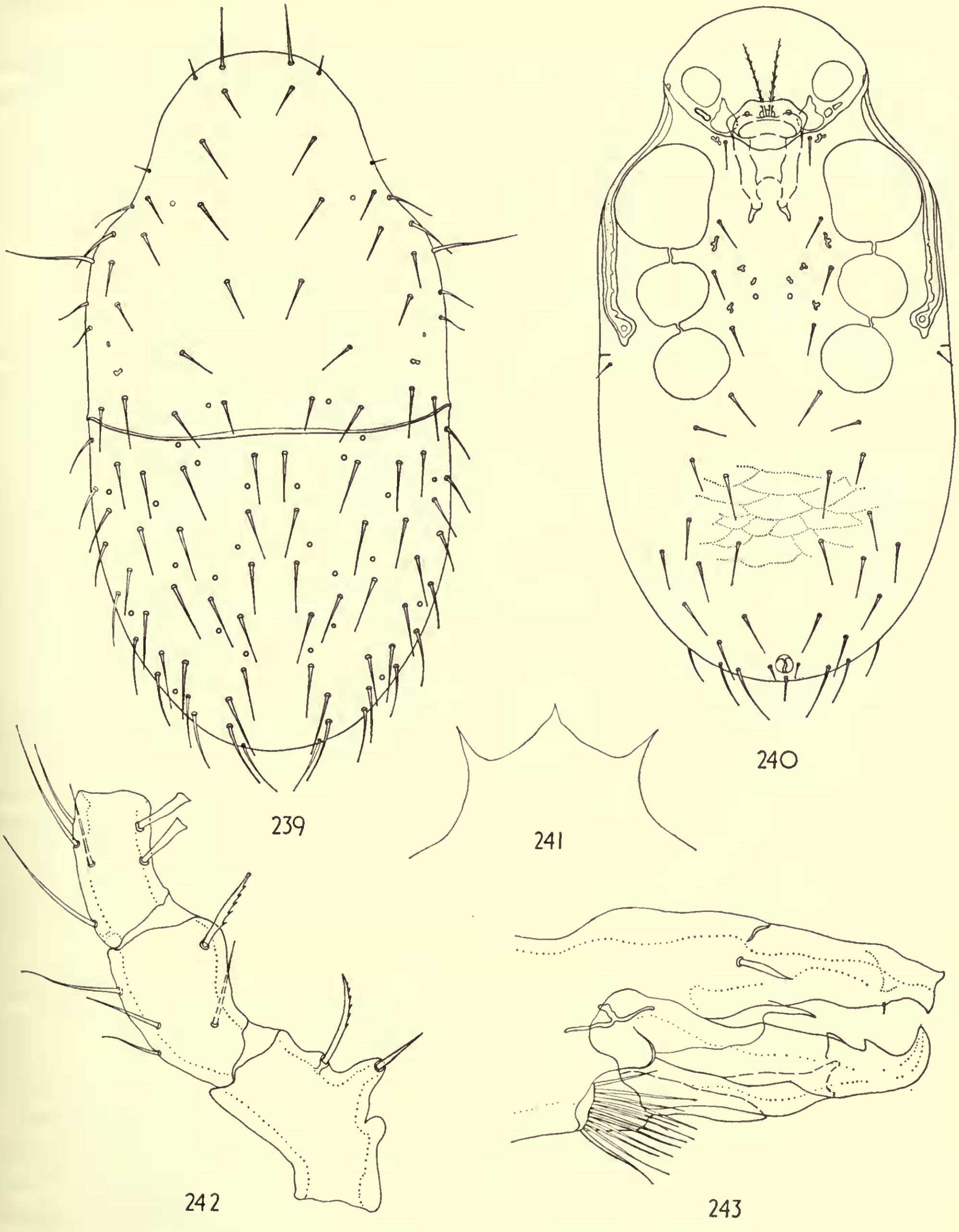
The tritosternal base is extremely reduced and provided with a pair of pilose laciniae. The distribution of the prae-endopodal shields and the shape of the genital lamina is shown in Text-fig. 240. The setation of the opisthogastral shield is as figured. The stigma is situated between coxae III and IV. The peritreme extends to coxa I. A pair of post-stigmatal setae is present.

The tectum is three-pronged (Text-fig. 241). The median tine has a broader base than those of the lateral ones. The trochanter, femur and genu of the pedipalp is shown in Text-fig. 242. The chelicera is robust and its dentition is delineated in Text-fig. 243. Some of the processes of the arthrodial membrane at the base of the movable digit are branched. There is a simple dorsal seta on the fixed digit. The corniculus is distinctly stalked. The lateral margins of the hypostomal processes are fringed.

The tibia, tarsus and prae-tarsus of leg I are 103–128μ, 158–187μ and 14–17μ long respectively. The femur, genu and tibia of leg II are spurred (Plate 5c and e). The femur is crassate. The tibial process may vary in form (Plate 5d). The trochanter of leg IV is simple.

Female. The dorsal shield (747–789μ long × 440–467μ wide) is broadly oval and sclerotized. The anterior half of the dorsal shield bears twenty-one pairs of setae and the posterior half is with twenty-eight. The length of the setae is variable in the posterior half (Text-fig. 244).

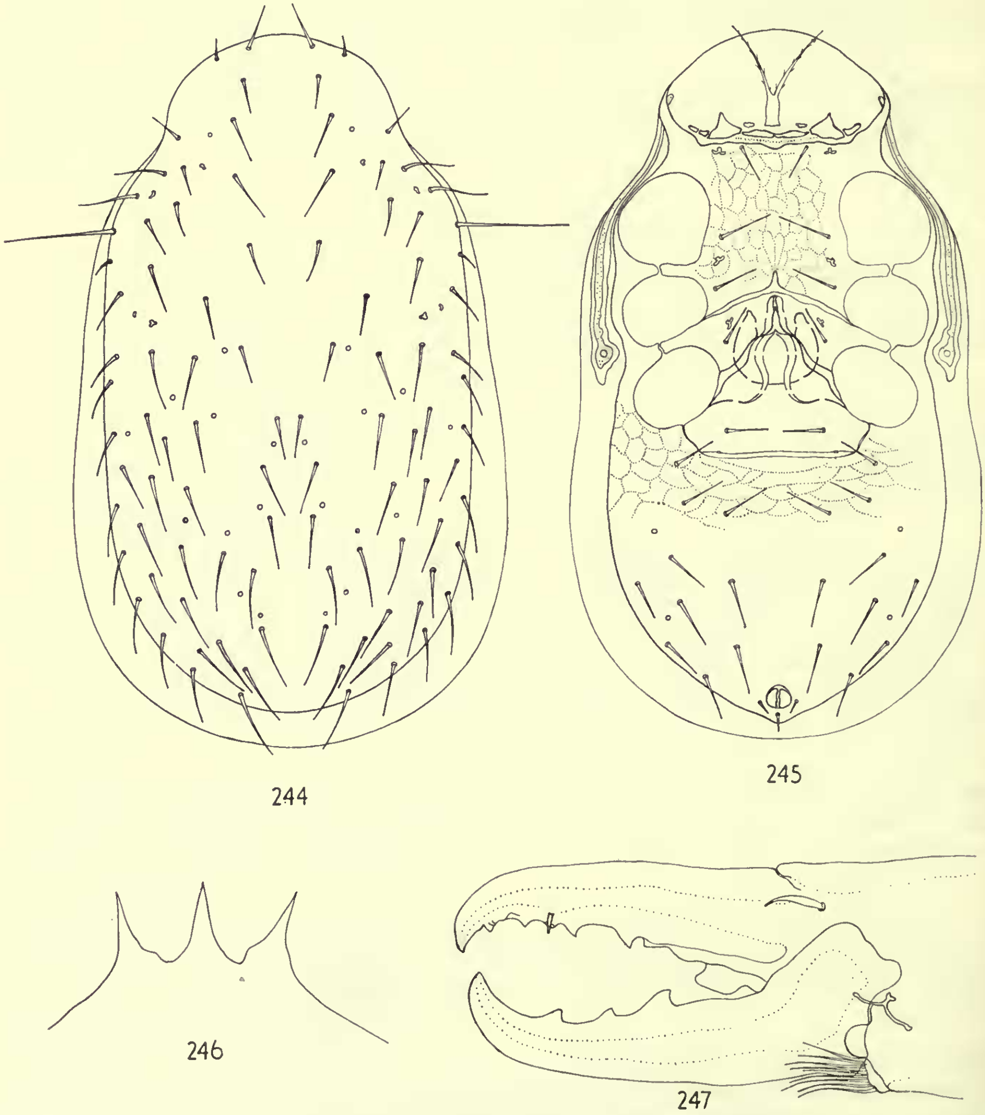
Ventrally, the tritosternum has a pair of pilose laciniae. The distribution of the prae-endopodal shields is shown in Text-fig. 245. The interscutal membrane in between the anterior margin of the sternal and prae-endopodal shields is striated. The endogynium has a pair of horns. The genital shield is shown in Plate 8j. The opisthogastral shield bears ten pairs of setae (excepting three setae associated with



FIGS. 239–243. *Pergamasus* (*Paragamasus*) *parrunciger* sp. nov., male.
Fig. 239 dorsum of idiosoma. Fig. 240 venter. Fig. 241 tectum. Fig. 242 trochanter, femur and genu of pedipalp. Fig. 243 chelicera.

the anus). The stigma is situated between coxae III and IV and the peritreme extends to the level of coxae I. The peritrematal shield extends for a short distance behind the stigma.

The tectum has three prongs of equal length (Text-fig. 246). The palpal femur and genu are with one comb-like and two spatulate setae, respectively. The fixed



Figs. 244–247. *Pergamasus* (*Paragamasus*) *parrunciger* sp. nov., female.
Fig. 244 dorsum of idiosoma. Fig. 245 venter. Fig. 246 tectum. Fig. 247 chelicera.

digit of the chelicera has four well-developed teeth ; the movable finger is tridentate (Text-fig. 247). Approximately the proximal half of the hypostomal processes are fringed.

The tibia, tarsus and prae-tarsus of leg I are 112–129µ, 175–179µ and 12–14µ long respectively. The trochanter of leg IV is without a tubercle.

HABITAT. I have examined five males and nine females from leaf mould (Leith Hill, Surrey, J. T. Salmon, 16.vi.1951) and have designated a male as the Holotype (1963.2.7.19) and a female as the Allotype (1963.2.7.20).

Pergamasus (Paragamasus) rothamstedensis sp. nov.

MALE. The dorsal shield (417µ long × 200–250µ wide) is light yellow in colour and oval in shape. The dorsum is devoid of a transverse suture and the posterior half of the dorsal shield bears a variable number of setae. The setae of the dorsal shield are comparatively short (Text-fig. 248).

Ventrally, the distribution of the prae-endopodal shields is shown in Text-fig. 249. The tritosternum is with a pair of pilose laciniae but its base is completely hidden by the genital sclerite. The anterior margin of the genital lamina is smooth. The distribution of setae on the opisthogastric shield is figured. The stigma is situated between coxae III and IV ; the peritreme anteriorly extends as far as the level of coxa I. Posteriorly the peritrematal shield extends to coxa IV. The post-stigmatal seta is absent.

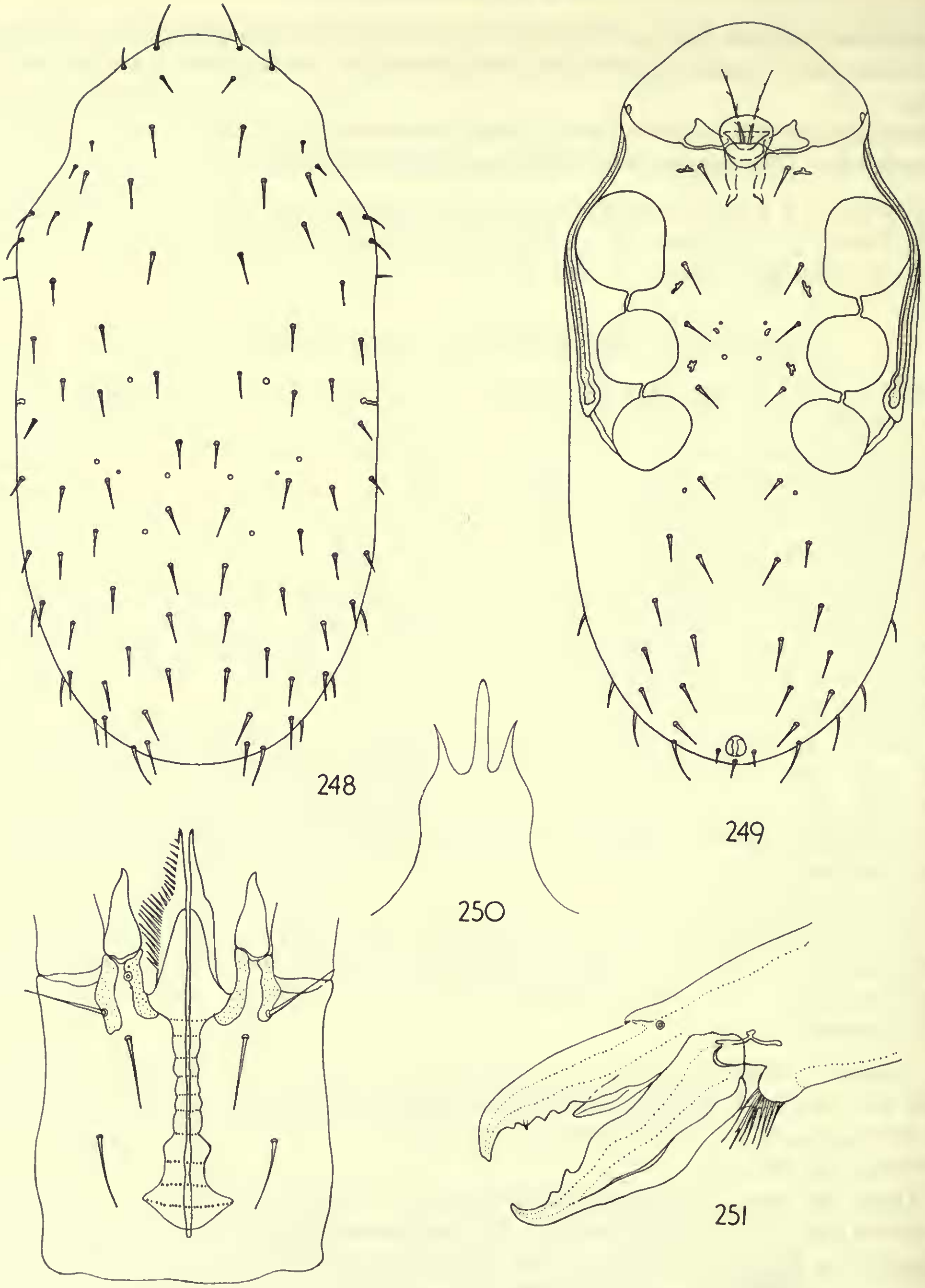
The tectum is three pointed. The median prong is the longest and is blunt (Text-fig. 250). The fixed digit of the chelicera (Text-fig. 251), is tridentate, and the movable digit is bidentate. The palp trochanter is without a tubercle. The corniculus is distinctly stalked (Text-fig. 252). The lateral margins of the hypostomal processes, excepting the basal part, are fringed. The deutosternum has ten transverse rows of denticles.

Leg I has the tibia, tarsus and prae-tarsus 62–66µ, 95–108µ and 8–12µ long, respectively. The femur of leg II (Plate 5f), is with a main and an accessory spur ; and the genual spur is less developed than the tibial process. The trochanter of leg IV is simple.

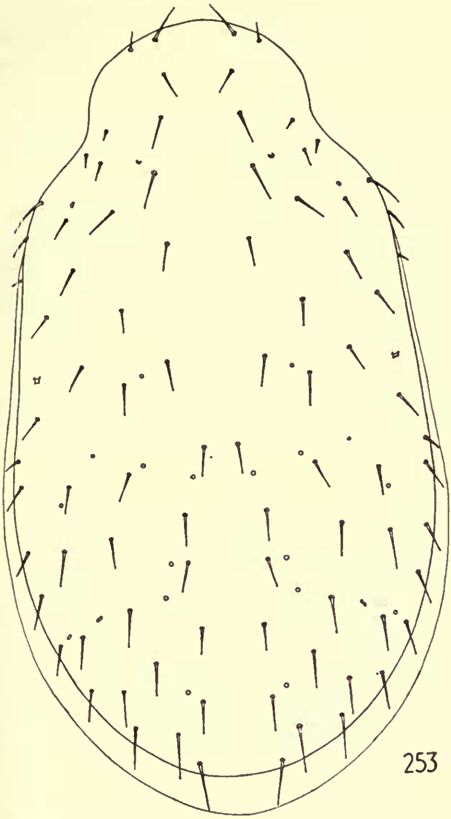
FEMALE. The dorsal shield (450–483µ long × 25–275µ wide) is weakly sclerotized and oval in shape (excepting the anterior region) (Text-fig. 253). The anterior half of the dorsal shield has twenty-one pairs of setae and the posterior half about twenty-two pairs.

There are three prae-endopodal shields, as shown in Text-fig. 254. The tritosternum has a pair of pilose laciniae. The metasternal shields are free. The epigynial shield is as shown in Plate 7k. The opisthogastric shield has eight pairs of setae (excepting the three anal setae). The stigma is situated between coxae III and IV ; and the peritreme extends to coxa I.

The tectum is three-pronged, the median being the longest (Text-fig. 255). The pedipalp is essentially similar to that in the male. The dentition of the chelicera is



FIGS. 248–252. *Pergamasus* (*Paragamasus*) *rothamstedensis* sp. nov., male. Fig. 248 dorsum of idiosoma. Fig. 249 venter. Fig. 250 tectum. Fig. 251 chelicera. Fig. 252 venter of gnathosoma.



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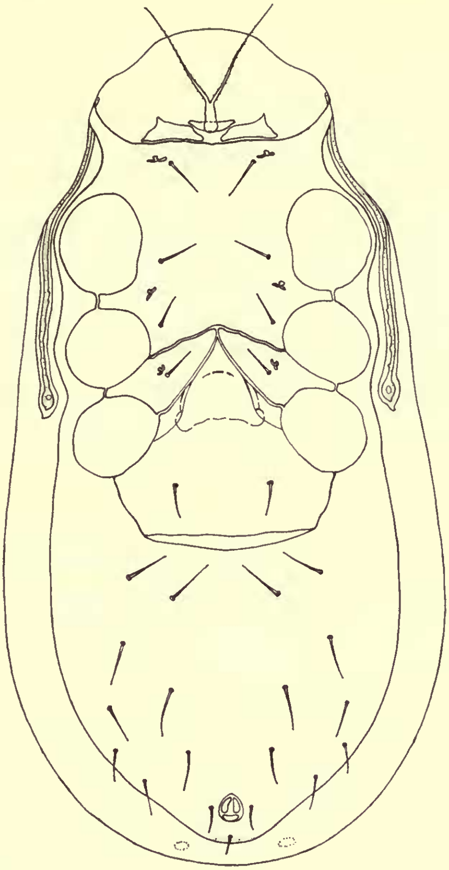

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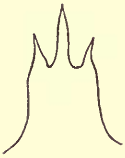

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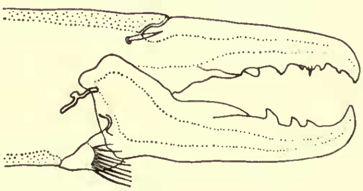

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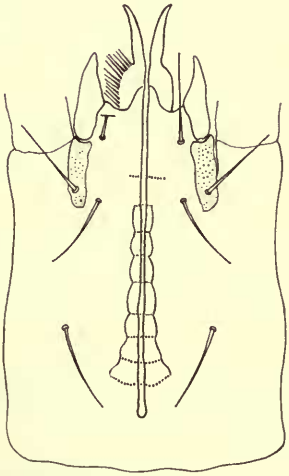

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FIGS. 253–257. *Pergamasus* (*Paragamasus*) *rothamstedensis* sp. nov., female.
Fig. 253 dorsum of idiosoma. Fig. 254 venter. Fig. 255 tectum. Fig. 256 chelicera.
Fig. 257 venter of gnathosoma.

shown in Text-fig. 256. About half of the lateral margins of the hypostomal processes are fringed. The arrangement of the transverse rows of denticles is figured (Text-fig. 257).

The tibia, tarsus and prae-tarsus of leg I are 66–74µ, 106–121µ and 10–12µ long respectively. The trochanter of leg IV is without any tubercle.

HABITAT. I have examined four females from litter under *Cupressus* sp. (Rothamsted Lodge, Rothamsted Experimental Station, Harpenden, Hertfordshire, G. Owen Evans and E. Browning, 18.iii.1957), and two males and four females from *Salix* sp. litter (British Museum (Natural History), London, S. K. Bhattacharyya, 5.iii.1962).

I have designated a male and female from the British Museum (Nat. Hist.), London (Coll. S. K. Bhattacharyya, 5.iii.1962) as the Holotype (1963.2.7.13) and Allotype (1963.2.7.14) respectively.

Pergamasus (Paragamasus) runciger (Berlese)

Parasitus longulus (C. L. Koch) Oudemans, A. C. (1902). *Tijdschr. Ent.* **45** : 37, figs.
Gamasus (*Pergamasus*) *runciger* Berlese, A. (1904). *Redia* **1** : 263 ; Berlese, A. (1906). *Redia* **3** : 214, figs. : Halbert, J. N. (1915). *Proc. R. Irish Acad.* **31** 39 ii : 51, figs.
Pergamasus runciger : Schweizer, J. (1961). *Denks. schweiz. naturf. Ges.* **84** : 54, figs. (in part).

MALE. The dorsal shield (838µ long × 433µ wide) is well sclerotized and provided with a transverse suture. The distribution of the setae on the dorsum is shown in Text-fig. 258.

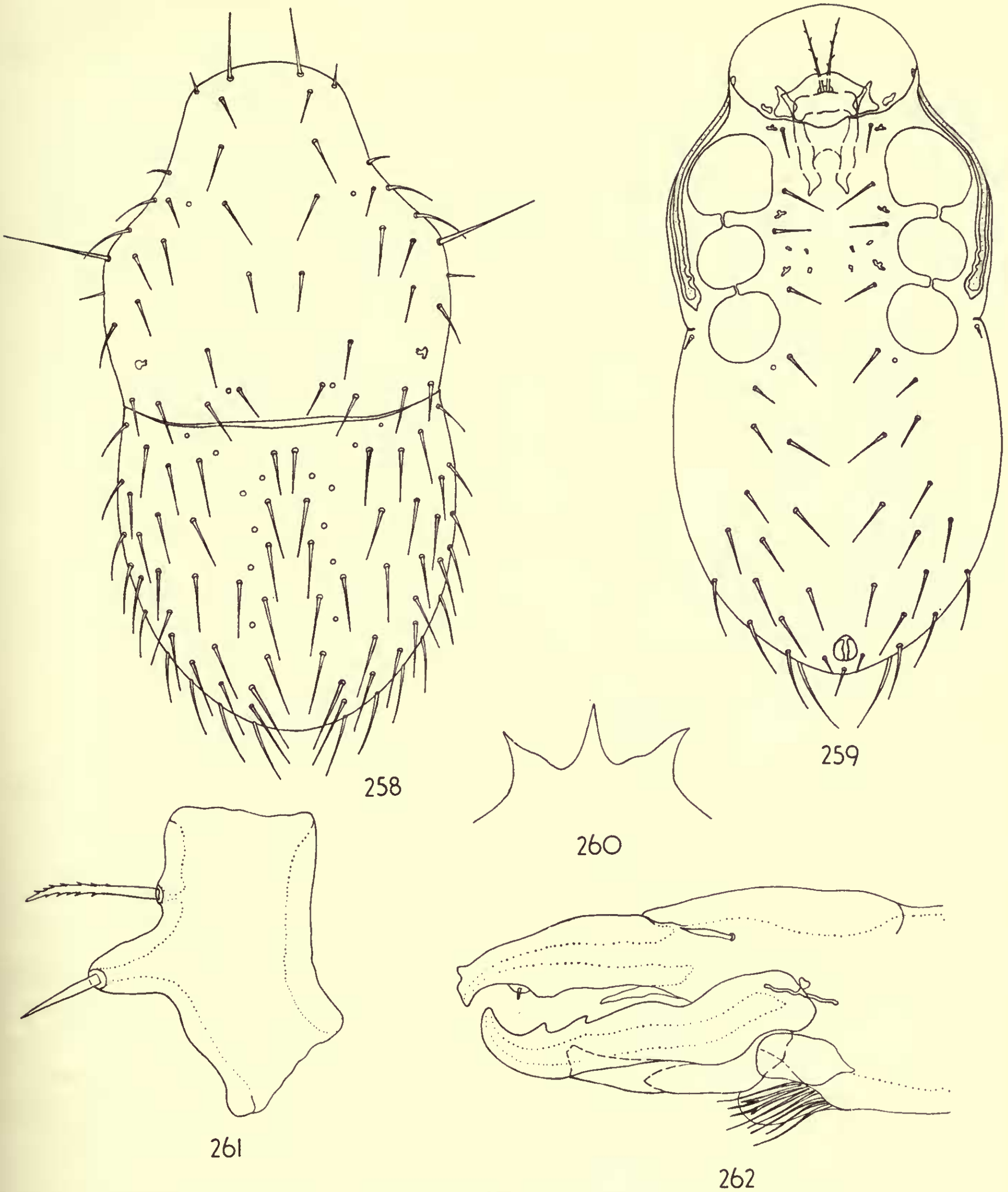
The tritosternum has a pair of pilose laciniae and its base is greatly reduced. The prae-endopodal shield and shape of the genital lamina is shown in Text-fig. 259. The stigma is situated between coxae III and IV ; and the peritreme extends to coxa I. A pair of post-stigmatal setae is present.

The tectum is three-pointed (Text-fig. 260). The distinctive features of the pedipalp are, the trochanter with a seta-bearing tubercle (Text-fig. 261), the femur with a comb-like and the genu with two spatulate setae. The chelicera is shown in Text-fig. 262.

The tibia, tarsus and prae-tarsus of leg I are 112–121µ, 150–154µ and 12µ long, respectively. The femur, genu and tibia of leg II are spurred (Plate 5g and h). The femur is crassate with a main falcate spur and an accessory spur. The trochanter of leg IV is simple.

FEMALE. The dorsal shield (815µ long × 450–483µ wide) is oval (excepting the anteriormost region) and bears about forty-eight pairs of setae of which twenty-one pairs are situated on the podonotal shield (Text-fig. 263).

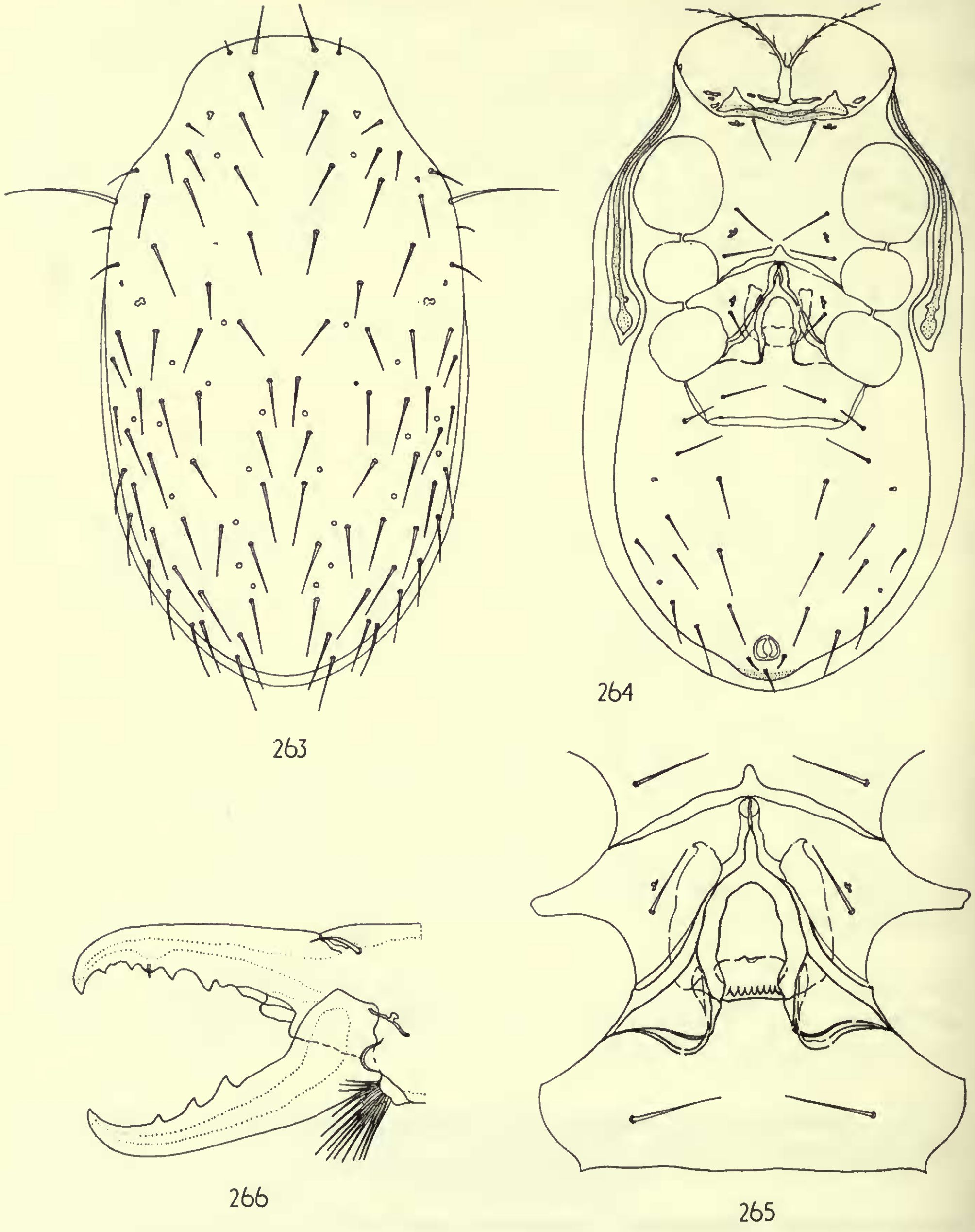
Ventrally, the tritosternum has a well-developed basal part and a pair of pilose laciniae. The distribution of the prae-endopodal shields is shown in Text-fig. 264. The metasternal shields are free. The endogynium has a pair of horns. The epigynial shield and details of the sterniti-genital region are shown in Plate 8k and Text-fig.



FIGS. 258–262. *Pergamasus* (*Paragamasus*) *runciger* (Berlese), male. Fig. 258 dorsum of idiosoma. Fig. 259 venter. Fig. 260 tectum. Fig. 261 trochanter of pedipalp. Fig. 262 chelicera.

265 respectively. Ten pairs of setae are situated on the opisthogastral shield. The position of the stigma and extension of the peritreme are similar to that in the male.

The tectum is three-pronged. The dentition of the chelicera is shown in Text-fig. 266.



FIGS. 263–266. *Pergamasus* (*Paragamasus*) *runciger* (Berlese), female.
Fig. 263 dorsum of idiosoma. Fig. 264 venter. Fig. 265 magnified structure of the sterniti-genital region. Fig. 266 chelicera.

The tibia, tarsus and prae-tarsus of leg I are 121–137μ, 170–191μ and 12–17μ long, respectively. The trochanter of leg IV is without any process.

DISTRIBUTION AND HABITAT. This species has been recorded from Holland (Oudemans, 1902), Norway (Berlese, 1904, 1906), Ireland (Halbert, 1915) and Switzerland (Schweizer, 1961).

I have examined specimens from litter and humus under pines and holly (near Duddleswell, Ashdown Forest, Sussex, K. H. Hyatt, 10.ix.1956). Moss and leaves (Adelaide Hill, Bowness, Cumberland, J. T. Salmon, 29.vi.1951). In marsh debris (Surlingham, Norfolk, J. T. Salmon, 12.v.1951). *Sphagnum*, etc. (Cock Hill, Yorks, J. T. Salmon, 21.vii.1951). In leaf mould (Epping Forest, Essex, J. T. Salmon, 27.v.1951). In litter (Stratton Strawless, near Aylsham, Norwich, Norfolk, J. T. Salmon). Hornbeam humus (Bookham Common, Surrey, Mrs. R. E. Teagle, xi.1956). In oak and beech leaf mould (Grasmere, Westmorland, J. T. Salmon, 26.vi.1951). Algae and rushes (Colletts Bridge, Norfolk, P. N. Lawrence, 16.x.1960). Beech leaf mould (Amersham, Bucks., M. E. Bacchus, 13.v.1951). Moss from crevices in rocks (near Force Forge, Westmorland, M. E. Bacchus, 2.xii.1951). Mosses on rotten wood (Killay, near River Clyne, Hen Parc Wood, Swansea, P. N. Lawrence, 24.iii.1962). Yew and rhododendron humus (26.iii.1962) and moss on tree and humus underneath (Killay, near River Clyne, Swansea, P. N. Lawrence, 24.iii.1962). Pine litter (Clyne Park, Swansea, S. K. Bhattacharyya, 4.i.1961).

Pergamasus (Paragamasus) schweizeri sp. nov.

MALE. The dorsal shield (697μ long × 332–350μ wide) is provided with a transverse suture and tapers posteriorly (Text-fig. 267).

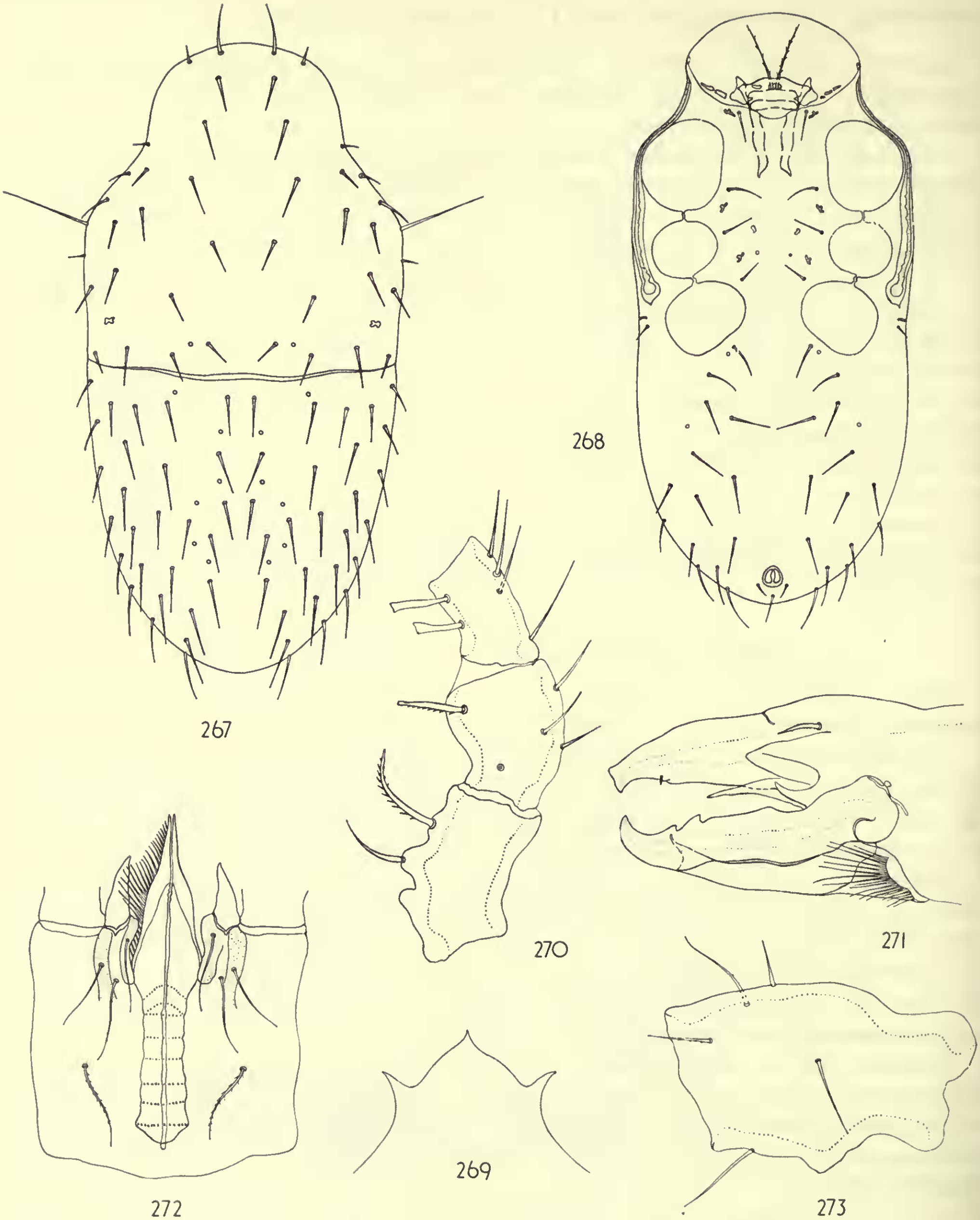
The tritosternal base is completely hidden by the genital lamina. The distribution of the prae-endopodal shields and the shape of the genital lamina is shown in Text-fig. 268. The stigma is situated between coxae III and IV; and the peritreme anteriorly extends to coxa I. A pair of post-stigmatal setae is present.

The tectum is three-tined (Text-fig. 269). The palp trochanter has two tubercles, and one of them (the distal) bears a simple seta (Text-fig. 270). The palpal femur and genu are provided with one comb-like and two spatulate setae, respectively. The dentition of the chelicera and the form of the spermadactyl process are shown in Text-fig. 271. There are stalked corniculi. The entire lateral margins of the hypostomal processes are fringed (Text-fig. 272).

The tibia, tarsus and prae-tarsus of leg I are 108–121μ, 158–170μ and 12μ long, respectively. The crassate femur of leg II is provided with a strong falcate spur and a small accessory spur; the genu and tibia are armed (Plate 6a). The distinctive feature of the trochanter of leg IV is constant in all males of the species examined (Text-fig. 273).

FEMALE. The dorsal shield measures 764–797μ long × 367–400μ wide and is provided with about forty-eight pairs of setae (Text-fig. 274).

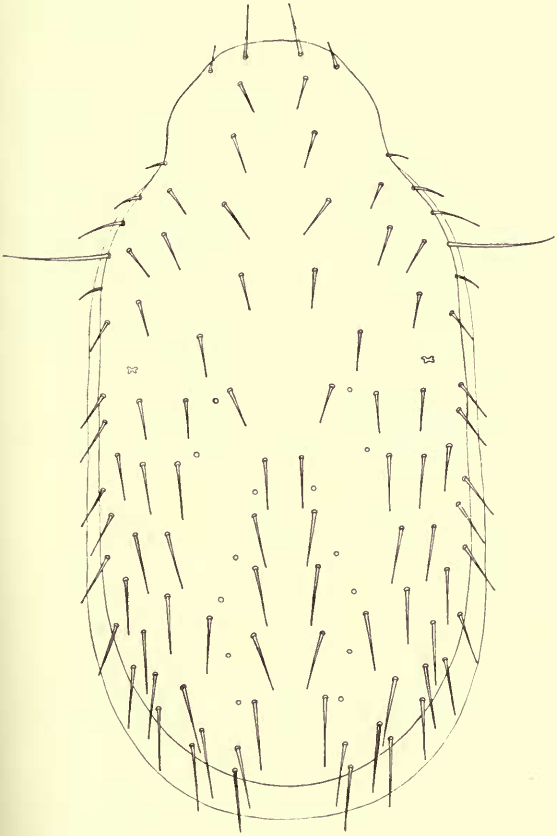
The tritosternum has a pair of pilose laciniae. Ventro-medially, the interscutal membrane between the prae-endopodal shields and the anterior margin of the



Figs. 267–273. *Pergamasus* (*Paragamasus*) *schweizeri* sp. nov., male.
Fig. 267 dorsum of idiosoma. Fig. 268 venter. Fig. 269 tectum. Fig. 270 trochanter, femur and genu of pedipalp. Fig. 271 chelicera. Fig. 272 venter of gnathosoma. Fig. 273 trochanter of leg IV.

sternal shield is striated (Text-fig. 275). The metasternal shields are free. The endogynium has a pair of horns and its process is comparatively simple. The genital shield is shown in Plate 81. The opisthogastral shield is normal, bearing ten pairs of setae. The stigma and peritreme are similar to those in the male.

The tectum is basically three-pronged but shows some variation (Text-fig. 276). The dentition of the chelicera is shown in Text-fig. 277.



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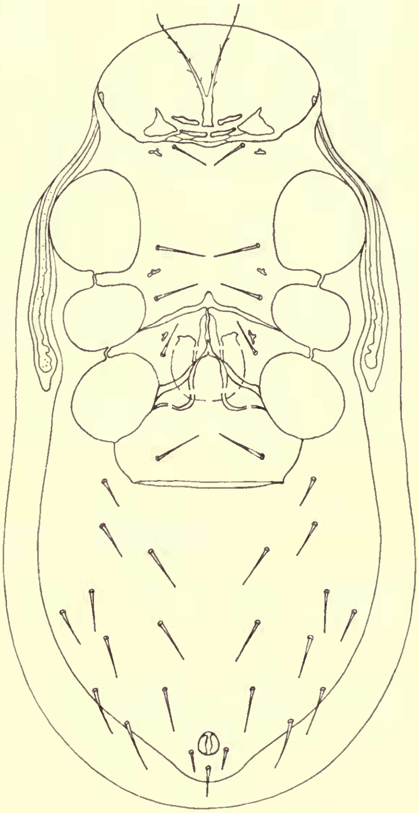

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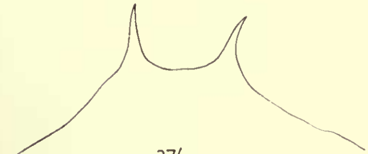

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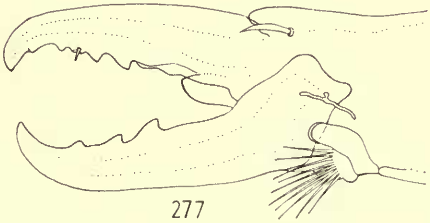

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FIGS. 274–277. *Pergamasus* (*Paragamasus*) *schweizeri* sp. nov., female. Fig. 274 dorsum of idiosoma. Fig. 275 venter. Fig. 276 tectum. Fig. 277 chelicera.

The tibia, tarsus and prae-tarsus of leg I are 116–129μ, 170–181μ and 12–17μ long, respectively.

Habitat. I have examined the following material: Seven males and four females from litter under thick evergreen hedge (St. Agnes, Isles of Scilly, Cornwall, K. H. Hyatt, 29.iii.1957). Twenty-two males and twenty females in litter and soil under evergreen trees (St. Agnes, Isles of Scilly, Cornwall, K. H. Hyatt, 5.iv.1957). One male and three females in moss (Grassington, Grass Woods, North Riding, Yorkshire, J. T. Salmon, 24.vi.1951). Two males and two females from moss on tree stumps and stones (Forest of Dean, Gloucestershire, J. T. Salmon, 27.ix.1951). One male from Stratton Strawless (near Aylsham, Norwich, Norfolk, J. T. Salmon, 13.v.195?). Three males and two females from leaf mould (Forest of Dean, Gloucestershire, J. T. Salmon, 27.ix.1951). One male from litter and humus under pines and holly (near Duddleswell, Ashdown Forest, Sussex, K. H. Hyatt, 10.ix.1956). Six males and eight females from lichens in crevices (Moel Siabod, North Wales, P. N. Lawrence, 22.x.1960). One male in mosses on rotten wood (Killay, near River Clyne, Hen Parc Wood, near Swansea, P. N. Lawrence, 24.iii.1962). One male from rotten stump (Gwydyr Forest, North Wales, P. N. Lawrence, 22.x.1960). Two males and two females in moss (Tarbet, Crianlarich, Loch Lomond, Dunbarton, J. T. Salmon, 3.vii.1951).

I have designated a male and a female from St. Agnes, Isles of Scilly (Coll. K. H. Hyatt, 29.iii.1957) as Holotype (1963.2.7.4) and Allotype (1963.2.7.5) respectively.

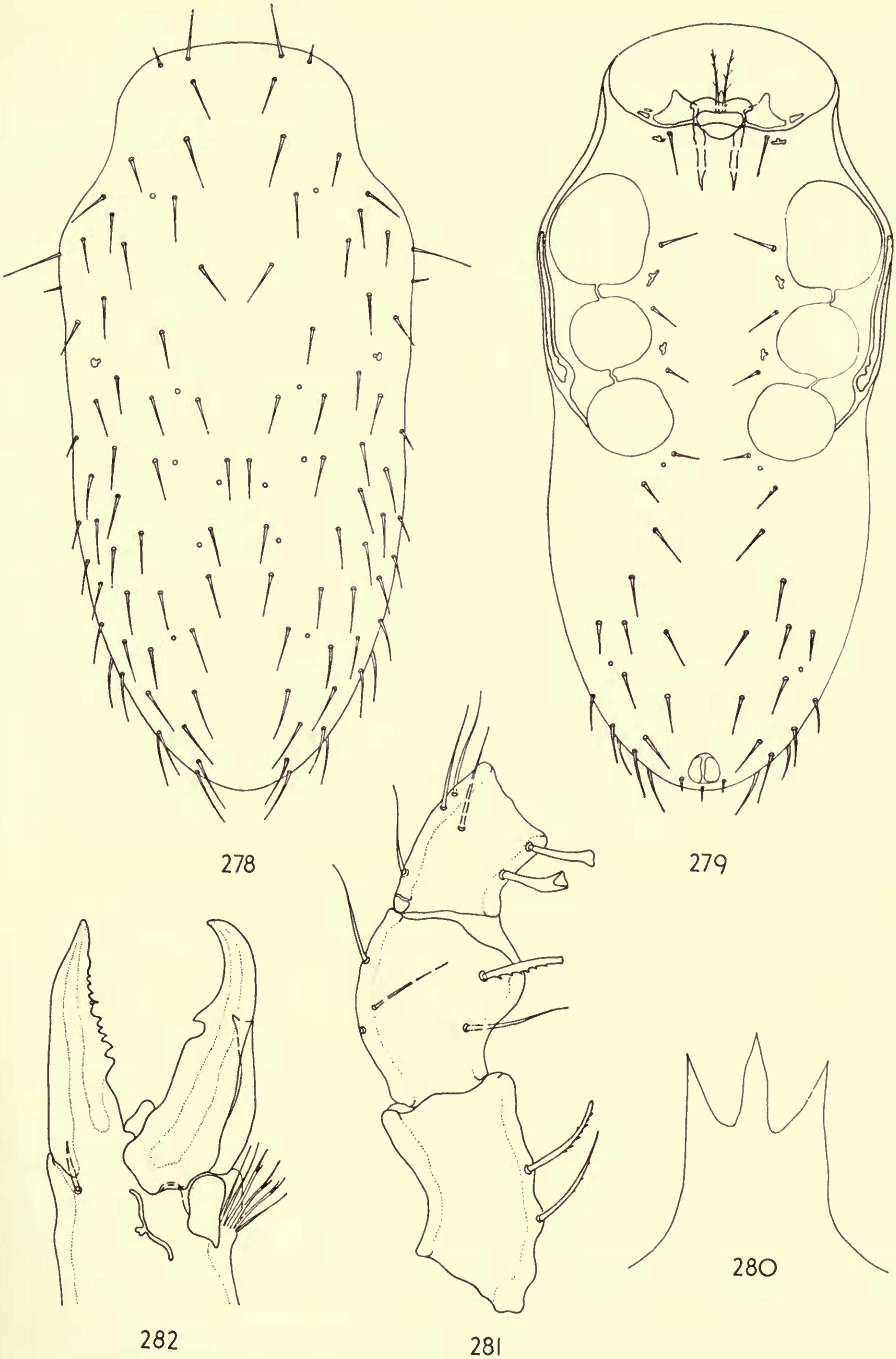
Pergamasus (Paragamasus) suecicus (Trägårdh)

Leptogamasus suecicus Trägårdh, I. (1936). *Ent. Tidskr.* 227, figs. Schweizer, J. (1961). *Denks. schweiz. naturf. Ges.* **84** : 10, figs.

Male. The dorsal shield (450–467μ long × 240–249μ wide) is deep yellow, well sclerotized and not entirely reticulated. The dorsum is without a median transverse suture and narrows posteriorly (Text-fig. 278).

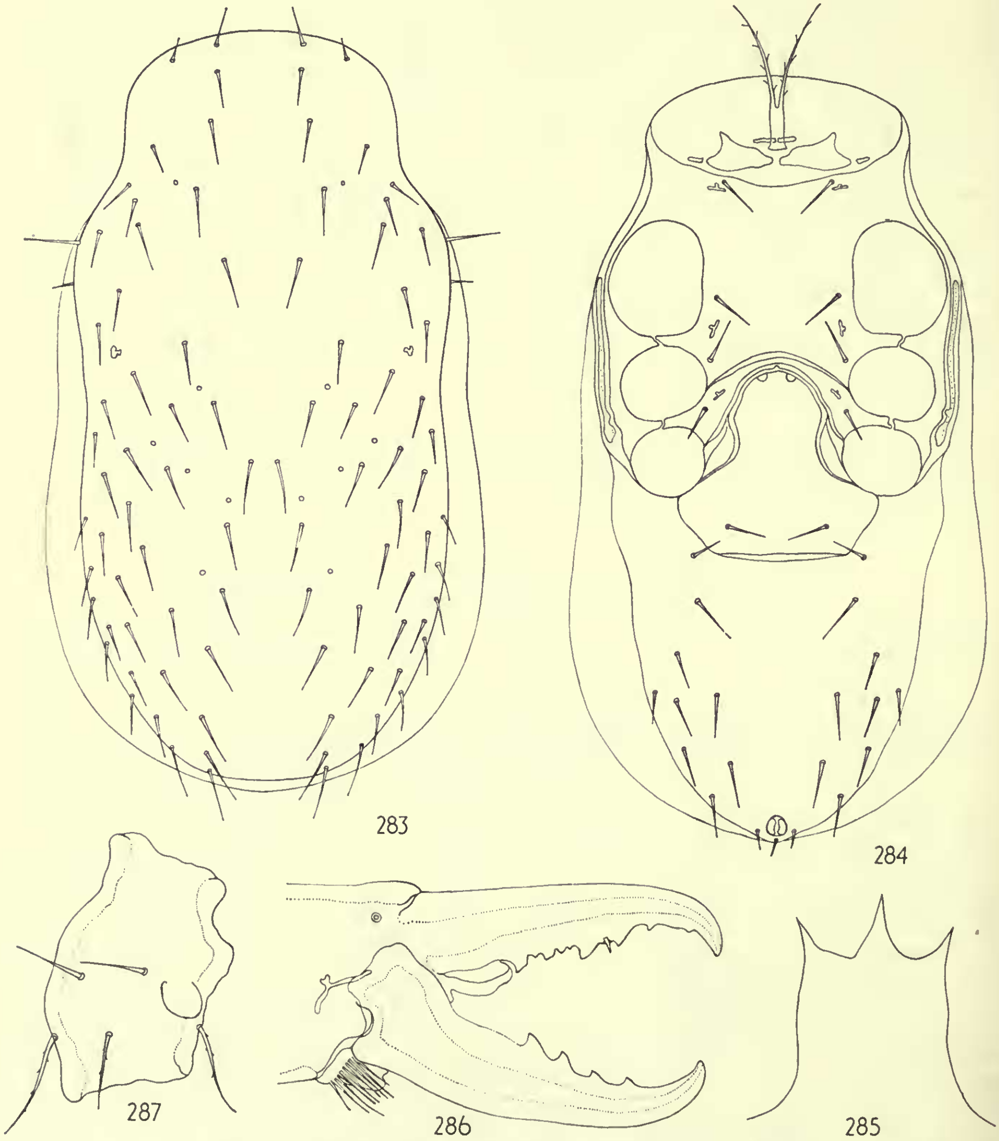
Ventrally, the tritosternum has a pair of well developed pilose laciniae. The basal part of the tritosternum is completely hidden by the genital sclerite. The prae-endopodal shields and pilose laciniae are also partly covered by the genital lamina. The setation of the opisthogastral shield is shown in Text-fig. 279. The stigma is situated between coxae III and IV; the peritreme reaches to coxa II. The post-stigmatal prolongation of the peritrematal shield extends to coxa IV.

The tectum is three-pronged (Text-fig. 280). The most distinctive features of the pedipalp are, the trochanter without any tubercle, the femur with a comb-like seta and the genu with two spatulate setae (Text-fig. 281). The fixed digit of the chelicera is provided with closely-set teeth of variable size; a pilus dentilis and a simple dorsal seta are also present (Text-fig. 282). The movable finger is unidentate and the spermadactyl is normal. A number of arthrodial processes, at the base of the movable digit, are branched.



Figs. 278–282. *Pergamasus* (*Paragamasus*) *suecicus* (Trägårdh), male. Fig. 278 dorsum of idiosoma. Fig. 279 venter. Fig. 280 tectum. Fig. 281 trochanter, femur and genu of pedipalp. Fig. 282 chelicera.

The tibia, tarsus and prae-tarsus of leg I are 74–78μ, 109–112μ and 8–10μ long, respectively. The femur, genu and tibia of leg II are spurred (Plate 6b). The femur is crassate, with a strong falcate main spur and an accessory spur. The genual spur is smaller than the tibial spur and almost rounded in shape. Trochanter IV is weakly tuberculated.



Figs. 283–287. *Pergamasus* (*Paragamasus*) *suecicus* (Trägårdh), female. Fig. 283 dorsum of idiosoma. Fig. 284 venter. Fig. 285 tectum. Fig. 286 chelicera. Fig. 287 trochanter of leg IV.

FEMALE. The shape and setation of the dorsal shield (474–490μ long × 249–256μ wide) are shown in Text-fig. 283. The dorsal shield bears about forty-seven pairs of setae of which twenty-one pairs are situated on the anterior half. The number of setae is only variable on the posterior half of the dorsal shield.

Ventrally, the tritosternum has an elongated basal part and a pair of pilose laciniae. There are three pairs of prae-endopodal shields, distributed as in Text-fig. 284. The metasternal shields are completely fused. Anteriorly, the epigynial shield is rounded in shape, except the anterior extremity, where the shield terminates in a knob-like structure (Plate 71). The opisthogastral shield is somewhat reduced and bears nine pairs of setae (excepting three setae associated with the anus). The peritrematal shield is completely coalesced with the opisthogastric shield posteriorly ; the peritreme only reaches to coxa II. The narrow, tubular post-stigmatal prolongation of the peritrematal shield extends to coxa IV.

The tectum is three-pronged (Text-fig. 285). The pedipalp is essentially similar to that in the male. The dentition of the fixed digit of the chelicera is figured, and the movable digit has four teeth (Text-fig. 286).

The tibia, tarsus and prae-tarsus of leg I are 78–83μ, 125μ and 8μ long, respectively. The distinctive feature of trochanter IV is shown in Text-fig. 287.

DISTRIBUTION AND HABITAT. This species is previously known from Sweden (Trägårdh, 1936), Britain (Evans, 1957) and Switzerland (Schweizer, 1961).

I have examined specimens from soil (Silwood Park, Berkshire, D. K. Choudhuri, 1958.2.13.12–16). (Corby, Northants, B. N. K. Davis, 1958). Larch litter (Merlewood, Lancashire, D. Macfarlane, v.1955). In moss and humus in hollow tree (Swansea University, Swansea, P. N. Lawrence, 26.iii.1962). Moss on cliff (Gwydyr Forest, North Wales, P. N. Lawrence, 22.x.1960).

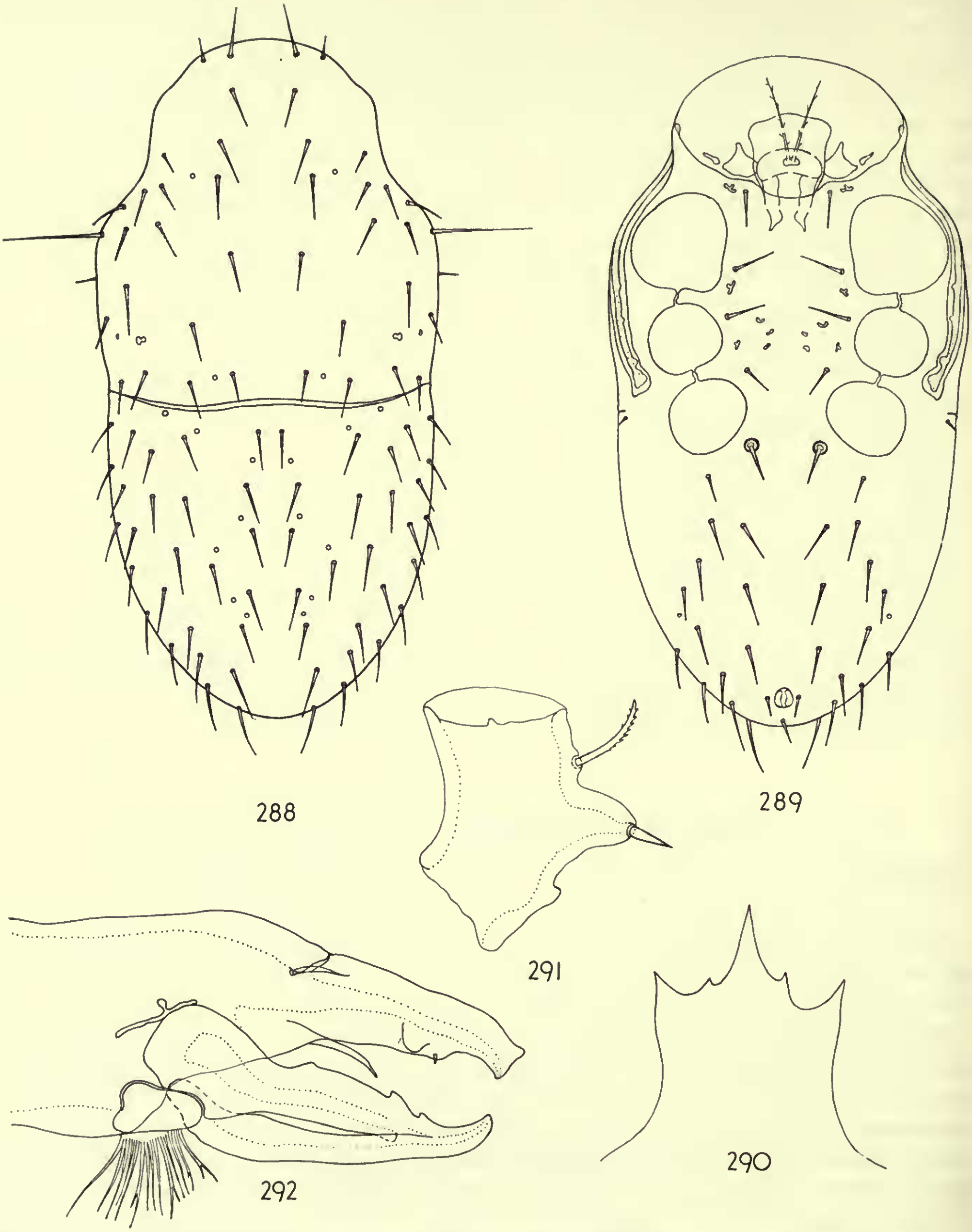
Pergamasus (Paragamasus) teutonicus Willmann

Pergamasus lapponicus Trägårdh var. *teutonica* Willmann, C. (1956). *Československ. parasit.* **33** : 215, figs.

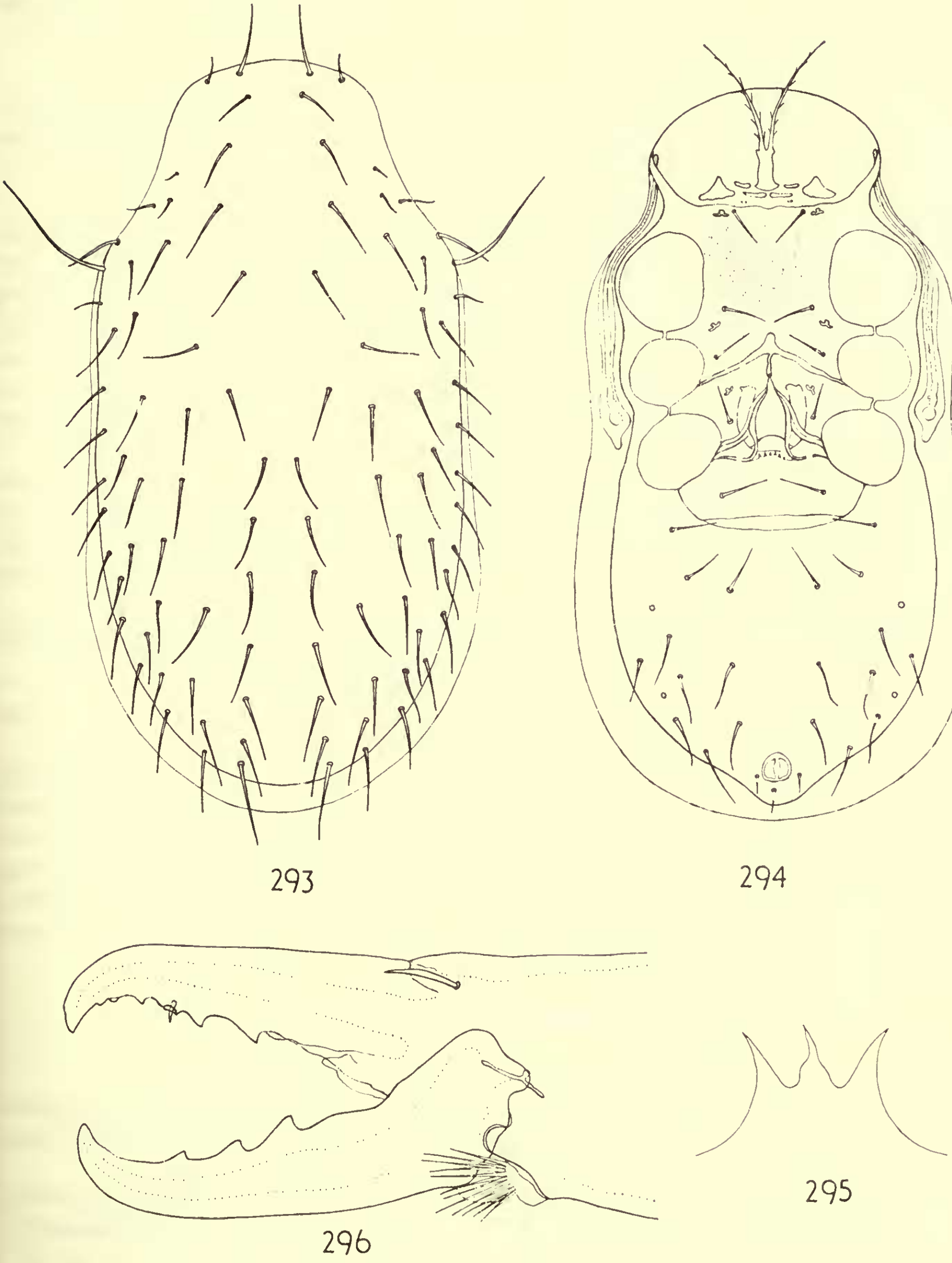
MALE. The dorsal shield is 697–732μ long × 350–417μ wide and has a transverse suture. The anterior shield bears twenty-one pairs of setae and the posterior half about twenty-six pairs (Text-fig. 288).

The distribution of the prae-endopodal shields is delineated in Text-fig. 289. The base of the tritosternum and its laciniae are covered by the genital sclerite and lamina. The most distinctive features of the venter are the presence of a rounded setae-bearing scale-like structure near the coxa IV. The setation of the opisthogastric shield is figured. The stigma is situated between coxae III and IV ; and the peritreme reaches to the level of coxa I. A pair of post-stigmatal setae is present.

The tectum is as figured (Text-fig. 290). The palp-trochanter and the dentition of the chelicera are shown in Text-figs. 291 and 292, respectively. The corniculus is stalked.



FIGS. 288–292. *Pergamasus* (*Paragamasus*) *teutonicus* Willmann, male. Fig. 288 dorsum of idiosoma. Fig. 289 venter. Fig. 290 tectum. Fig. 291 trochanter of pedipalp. Fig. 292 chelicera.



FIGS. 293–296. *Pergamasus* (*Paragamasus*) *teutonicus* Willmann, female. Fig. 293 dorsum of idiosoma. Fig. 294 venter. Fig. 295 tectum. Fig. 296 chelicera.

The tibia, tarsus and prae-tarsus of leg I are 104–121µ, 164–175µ and 10–17µ long, respectively. The trochanter of leg II is without any tubercle. The femur, genu and tibia are armed with spurs (Plate 6c). The trochanter of leg IV may be with a weakly developed tubercle.

FEMALE. The dorsal shield (697–747µ long × 389–433µ wide) is oval, and yellow in colour and regionally reticulated. The anterior half of the dorsal shield has twenty-one pairs of setae and the posterior half about twenty-seven pairs (Text-fig. 293).

The tritosternum has an elongated base and a pair of pilose laciniae. The distribution of the prae-endopodal shields is shown in Text-fig. 294. The interscutal membrane between the anterior margin of the sternal shield and the prae-endopodal shield is striated. The reticulation of the sternal shield is figured. The metasternal shields are free. The endogynium has a pair of horns. The genital shield is as in Plate 8m and n. The opisthogastral shield, with ten pairs of setae (excepting three setae associated with the anus). The position of the stigma and extension of the peritreme are similar to those in the male.

The tectum is three-pronged (Text-fig. 295). The pedipalp is essentially similar to that of the male except for the absence of the armature on the trochanter. The dentition of the chelicera is as figured (Text-fig. 296). The proximal half of the hypostomal margins are fringed. The deutosternal denticles are arranged in nine to ten transverse rows.

The tibia, tarsus and prae-tarsus of leg I are 104–125µ, 160–183µ and 12–21µ long, respectively. The trochanter of leg IV is without any tubercle.

DISTRIBUTION AND HABITAT. Only the male of this species has previously been recorded from Czechoslovakia (Willmann, 1956).

I have examined material from : under bark of fallen elm tree (Harefield, Middlesex, A. H. G. Alston). Beech leaf mould (Amersham, Buckinghamshire, M. E. Bacchus, 13.v.1951). In beech leaf mould from steep bank (Rickmansworth, Herts., M. E. Bacchus, 25.ii.1951). Soil in aquarium house (Botanic Garden, Cambridge, A. H. G. Alston, 13.iv.1957). In pine litter (Clyne Park, Swansea, S. K. Bhattacharyya, 4.i.1961). Moss and humus in hollow tree (Swansea University, P. N. Lawrence, 26.iii.1962).

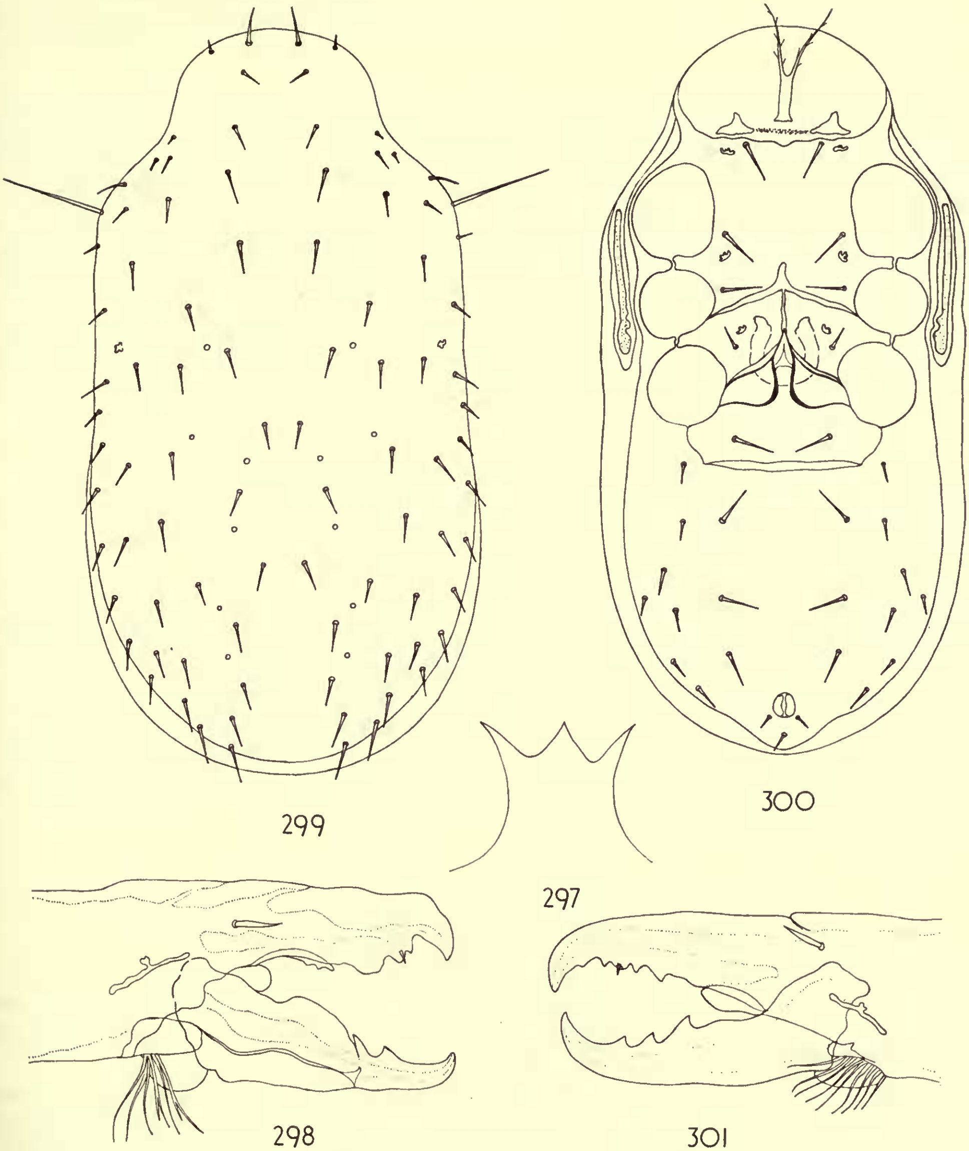
Pergamasus (Paragamasus) truncus Schweizer

Pergamasus truncus Schweizer, J. (1961). *Denks. schweiz. naturf. Ges.* **84** : 44, figs.

MALE. The dorsal shield (515µ long × 240–250µ wide) has a median transverse suture and is lightly sclerotized. The anterior region of the dorsal shield bears twenty-one pairs of setae. The dorsum has comparatively short setae.

The tritosternum has a pair of pilose laciniae. The genital lamina is somewhat similar to that of *P. wasmanni*. The stigma is situated between coxae III and IV ; the peritreme extends to coxa II. The post-stigmatal seta is present.

The tectum is three-tined, the median prong being the shortest (Text-fig. 297). The most distinctive features of the pedipalp are : the trochanter is without a



FIGS. 297–301. *Pergamasus* (*Paragamasus*) *truncus* Schweizer.
Fig. 297 tectum of male. Fig. 298 chelicera of male. Fig. 299 dorsum of idiosoma in female. Fig. 300 venter of female. Fig. 301 chelicera of female.

tubercle, the comb-like seta on the femur and the two spatulate setae on the genu are present. The chelicera is shown in Text-fig. 298. The corniculus is distinctly stalked.

The tibia, tarsus and prae-tarsus of leg I are 74–78μ, 108–129μ and 10–12μ long, respectively. The distinctive spurs of leg II are delineated in Plate 6d. The trochanter of leg IV is weakly spurred and the process somewhat resembles that in *P. misellus*.

Female. The dorsal shield (532μ long × 267μ wide) is yellow in colour and provided with comparatively short setae (Text-fig. 299). The anterior region of the dorsal shield bears twenty-one pairs of setae and the posterior region twenty-four pairs.

Ventrally, the tritosternum has an elongated basal part and a pair of pilose laciniae. The distribution of prae-endopodal shields is shown in Text-fig. 300. The endogynium has a pair of horns ; the genital shield is shown in Plate 8b. The opisthogastral shield is with ten pairs of setae (excepting three setae associated with the anus). The stigma is situated between coxae III and IV. Although the peritrematal shield anteriorly extends to the level of coxa I, the peritreme only reaches to coxa II.

The tectum is three-tined. The pedipalp is essentially the same as in the male. The dentition of the chelicera is shown in Text-fig. 301.

The tarsus (116–129μ) of leg I is longer than the tibia (74–80μ). The prae-tarsus is 6–8μ long. The trochanter of leg IV is armed.

Distribution and Habitat. This species has been recorded only from Switzerland (Schweizer, 1961). I have examined specimens from a number of localities in Wales : Turf among bracken (Clyne Common, Swansea, P. N. Lawrence, 29.iii.1962). Salt marsh debris (Llanrhidian, Glamorgan, P. N. Lawrence, 27.iii.1962). Moorland mosses, *Sphagnum* by stream (S. Llanrhidian, S. Wales, P. N. Lawrence, 27.iii.1962). Mosses on rotten wood (Killay, near River Clyne, Hen Parc Wood, Swansea, P. N. Lawrence, 24.iii.1962). Oak litter (Llew Reservoir, Swansea, S. K. Bhattacharyya, 2.i.1961).

Pergamasus (Paragamasus) wasmanni (Oudemans)

Parasitus wasmanni Oudemans, A. C. (1902). *Tijdschr. Ent.* **45** : 39, figs.

Male. The dorsal shield (467–483μ long × 240–274μ wide) has a transverse suture (Text-fig. 302). The anterior half of the dorsal shield bears twenty-one pairs of setae.

The tritosternum has a reduced basal part and a pair of pilose laciniae. There is a pair of prae-endopodal shields flanking the genital sclerite. The shape of the genital lamina and the setation of the opisthogastric shield are shown in Text-fig. 303. The stigma is situated between coxae III and IV ; and the peritreme extends to coxa II. A pair of post-stigmatal setae is present.

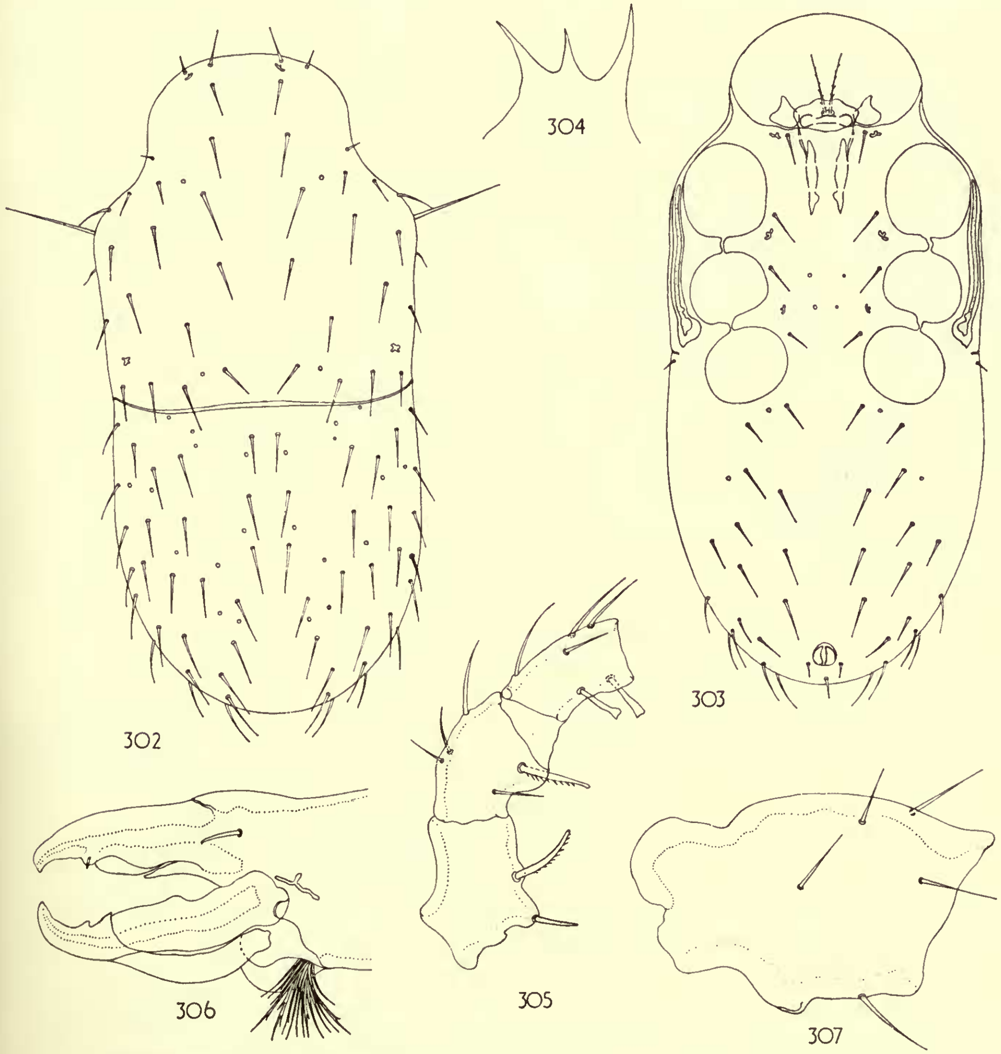
The tectum is three-pronged (Text-fig. 304). The palpal trochanter is tuberculated (Text-fig. 305). The femur and genu are provided with a comb-like and two spatulate setae, respectively. The chelicera is as shown in Text-fig. 305. The spermadactyl is normal. The corniculus is distinctly stalked.

Leg I is with tibia and tarsus 66–78μ and 112–116μ long, respectively ; the prae-tarsus is 10μ long. The diagnostic characters of leg II are shown in Plate 6e.

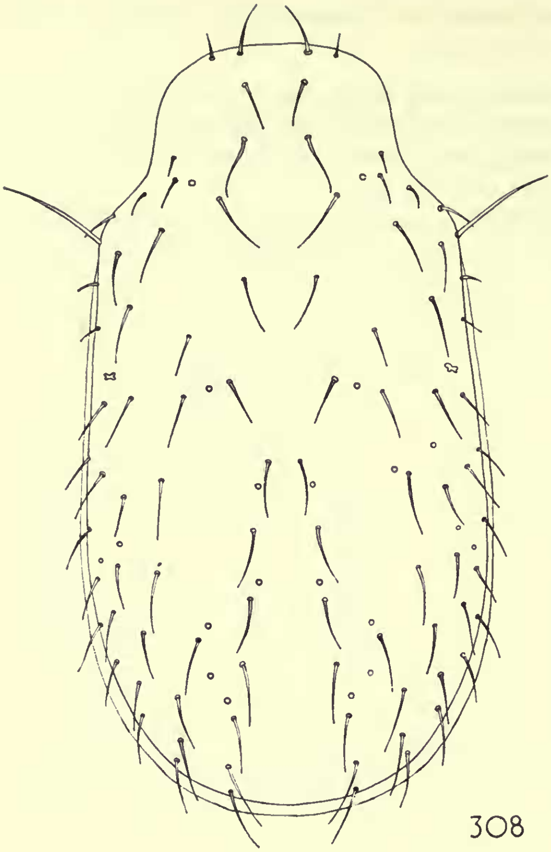
The tibial spur differs from the genual process by being slightly broader. The trochanter of leg IV is delineated in Text-fig. 307.

FEMALE. This sex is weakly sclerotized and light yellow in colour. The dorsal shield (507–522μ long × 267μ wide) is regionally reticulated and provided with about forty-six pairs of setae, of which twenty-one pairs of setae are situated on the anterior half of the dorsal shield (Text-fig. 308).

The tritosternum is biramous. There are three prae-endopodal shields, the median shield being an elongated strip (Text-fig. 309). The interscutal membrane



FIGS. 302–307. *Pergamasus* (*Paragamasus*) *wasmanni* (Oudemans), male. Fig. 302 dorsum of idiosoma. Fig. 303 venter. Fig. 304 tectum. Fig. 305 trochanter, femur and genu of pedipalp. Fig. 306 chelicera. Fig. 307 trochanter of leg IV.



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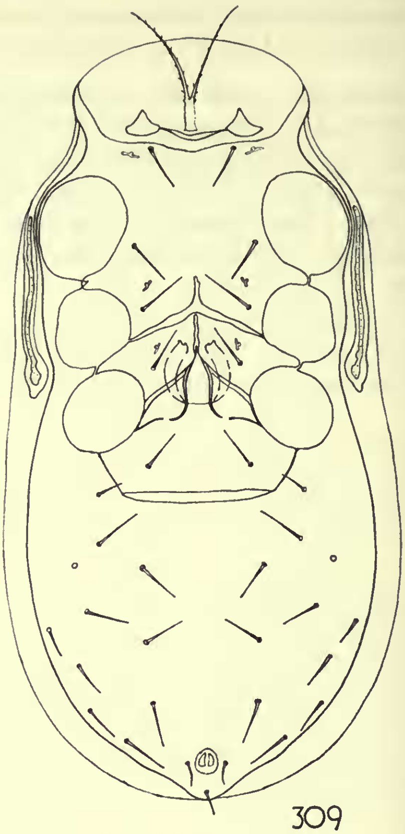

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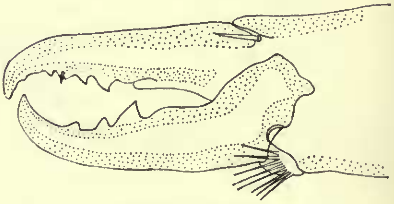

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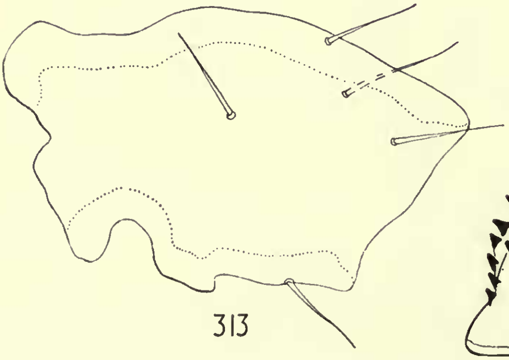

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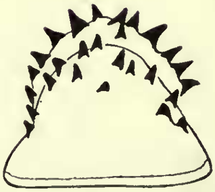

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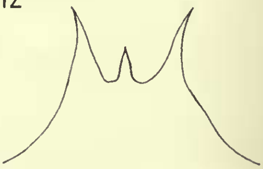

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FIGS. 308–313. *Pergamasus* (*Paragamasus*) *wasmanni* (Oudemans), female. Fig. 308 dorsum of idiosoma. Fig. 309 venter. Fig. 310 endogynial process. Fig. 311 tectum. Fig. 312 chelicera. Fig. 313 trochanter of leg IV.

between the anterior margin of the sternal shield and the prae-endopodal shields is without striations. The metasternal shields are almost fused in the mid-line. The endogynium has a pair of horns and its process is shown in Text-fig. 310. The genital shield is as in Plate 8e. The setation of the opisthogastral shield is figured. The stigma is situated between coxae III and IV. Anteriorly, the peritrematal shield extends to the level of coxa I, but the peritreme reaches to coxa II.

The tectum is three-pointed, the median prong being short and narrow (Text-fig. 311). The pedipalp resembles that of the male but the trochanter lacks tubercles. The chelicera is shown in Text-fig. 312. The lateral margins of the hypostomal processes are fringed. The ventral groove of the gnathosoma is provided with ten transverse rows of deutosternal denticles.

The tibia and tarsus of leg I are 70–74μ and 121–125μ long, respectively; the prae-tarsus is 8–10μ long. The trochanter of leg IV is tuberculated (Text-fig. 313).

DISTRIBUTION AND HABITAT. Only the female of this species is previously known from Holland (Oudemans, 1902).

I have examined material from litter and humus under pines and holly (near Duddleswell, Ashdown Forest, Sussex, K. H. Hyatt, 10.ix.1956). Moss and leaves (Adelaide Hill, Bowness, Cumberland, J. T. Salmon, 29.vi.1951). In leaf mould (Savernake Forest, Berkshire, J. T. Salmon, 26.ix.1951). In moss (Grassington, Grass Woods, North Riding of Yorkshire, J. T. Salmon, 24.vi.1951). Leaves from *Sequoia sempervirens* (Virginia Water, Surrey, A. H. G. Alston, 18.xii.1955). (Red Bank, Grasmere, Westmorland, M. E. Bacchus, 3.xii.1954). Oak and rhododendron humus (Penn Ponds, Richmond Park, Surrey, P. N. Lawrence, 10.iii.1957). Holly humus (near Groombridge, Sussex, P. N. Lawrence, 3.iii.1957). Heath and birch (St. Faith's Common, Horsford, Norwich, Norfolk, J. T. Salmon, 13.v.1951). In leaf mould (Burnham Beeches, Buckinghamshire, J. T. Salmon, 3.vi.1951). Rhododendron humus (Swansea University, Swansea, P. N. Lawrence, 26.iii.1962).

RECORDS OF OTHER BRITISH SPECIES OF *Pergamasus* Berlese *s. lat.*

According to " A synonymic Catalogue of British Acari " compiled by Turk (1953) the following species also occur in the British Isles. I have not been able to examine authentic British specimens of these species.

1. *Amblygamasus dentipes* (Koch, 1839).
2. *Pergamasus alpestris* var. *coniger* Hull, 1916.
3. *Pergamasus processiferus* Halbert, 1915.
4. *Pergamasus johnstoni* Oudemans, 1936.
   (nom. nov. pro *Gamasus marginatus* Johnston, 1848 non *Gamasus marginatus* Latr., 1806).
5. *Paragamasus runcatellus* (Berlese, 1906).
   The British records of this species probably refer to *P.* (*Paragamasus*) *schweizeri* sp. nov.
6. *Paragamasus decipiens* (Berlese, 1904).
7. *Paragamasus minor* (Berlese, 1892).

8. *Plesiogamasus paripes* (Hull, 1918).
9. *Plesiogamasus parvulus* (Berlese, 1903).
10. *Plesiogamasus parvulus* var. *dilatatellus* (Berlese, 1906).

The records of *Pergamasus barbarus* Berl. and *Pergamasus mediocris* Berl. given by Turk & Turk (1952) are based on misidentifications ; the species involved being *P.* (*P.*) *septentrionalis* (Oudemans) and *P.* (*P.*) *longicornis* Berlese.

SUMMARY

This work deals with a revision of the British species of the genus *Pergamasus* Berlese s. lat. On the basis of the chaetotaxy of the dorsum of the idiosoma the genus is divided into two subgenera, *Pergamasus* s. str. and *Paragamasus* Hull. Thirty-two species are described, figured and keyed. The following new species are described :—

Pergamasus (*Pergamasus*) *hortensis* sp. nov.
Pergamasus (*Paragamasus*) *alstoni* sp. nov
cambriensis sp. nov.
cassiteridum sp. nov.
celticus sp. nov.
femoratus sp. nov.
integer sp. nov.
londonensis sp. nov.
longisetosus sp. nov.
minimus sp. nov.
nathistmus sp. nov.
parrunciger sp. nov.
rothamstedensis sp. nov.
schweizeri sp. nov.

The following species are recorded for the first time from Britain : *P.* (*Pergamasus*) *mirabilis* Willm., *P.* (*Paragamasus*) *leruthi* Cooreman, *P.* (*Paragamasus*) *teutonicus* Willm., *P.* (*Paragamasus*) *truncus* Schweizer and *P.* (*Paragamasus*) *wasmanni* (Oudemans).

ACKNOWLEDGEMENTS

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My thanks are also due to Dr. J. Cooreman (Brussels) for the loan of type material, to Dr. L van der Hammen (Leiden) for material from the Oudemans Collection, and Prof. A. Melis (Florence) for permission to work on the Berlese Collection. Finally, I have pleasure in expressing my gratitude to the Central Research Funds Committee (University of London) for financial assistance.

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